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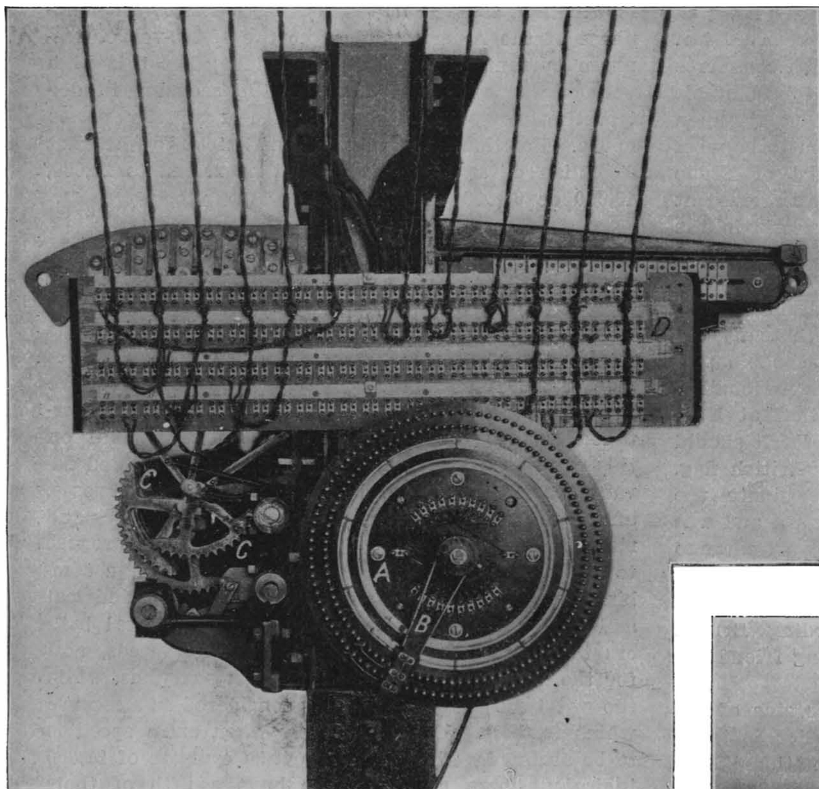
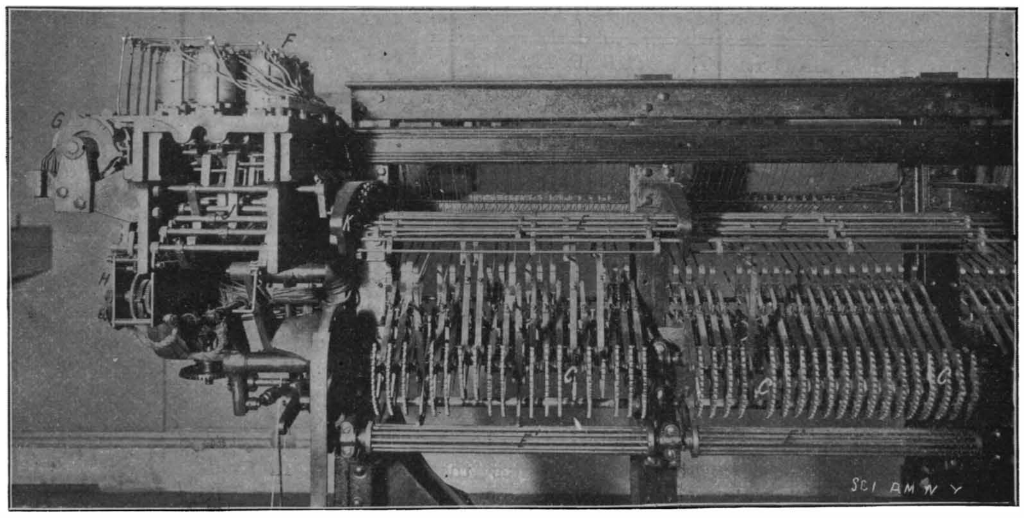
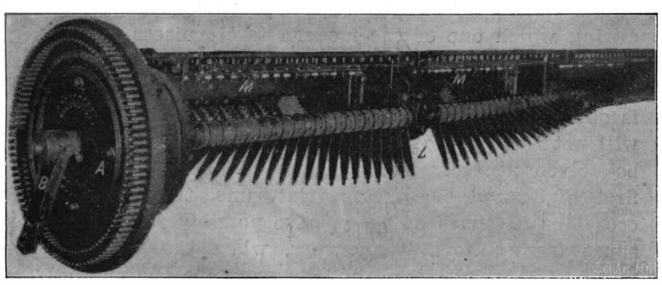


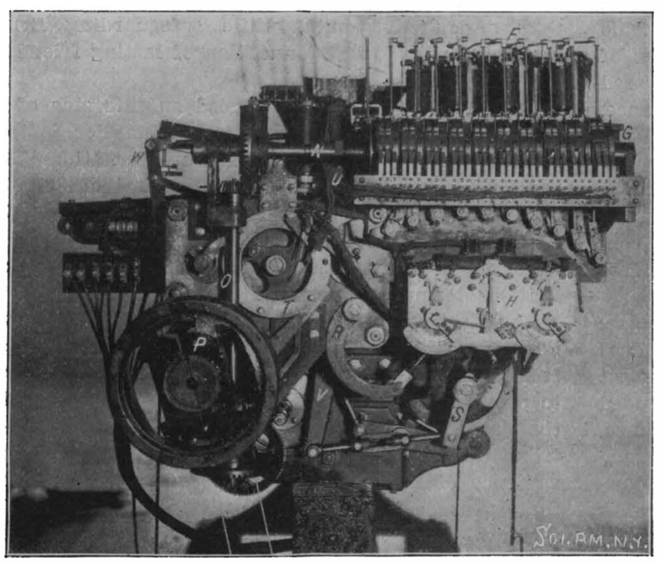
View from the Right—Showing Rotary Contact-Maker.



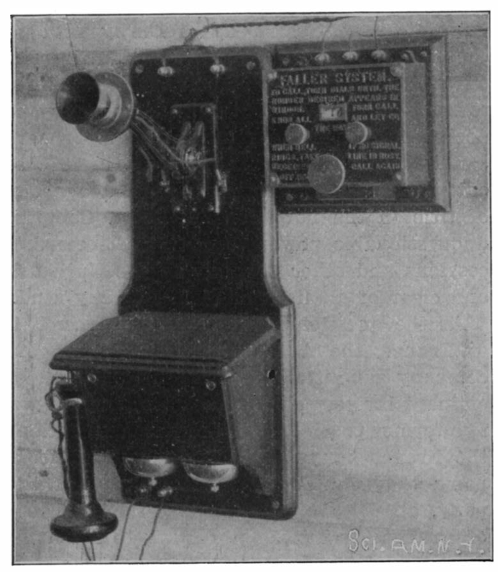
Front View of Shuttles Showing Several Lifted into Talking Position.



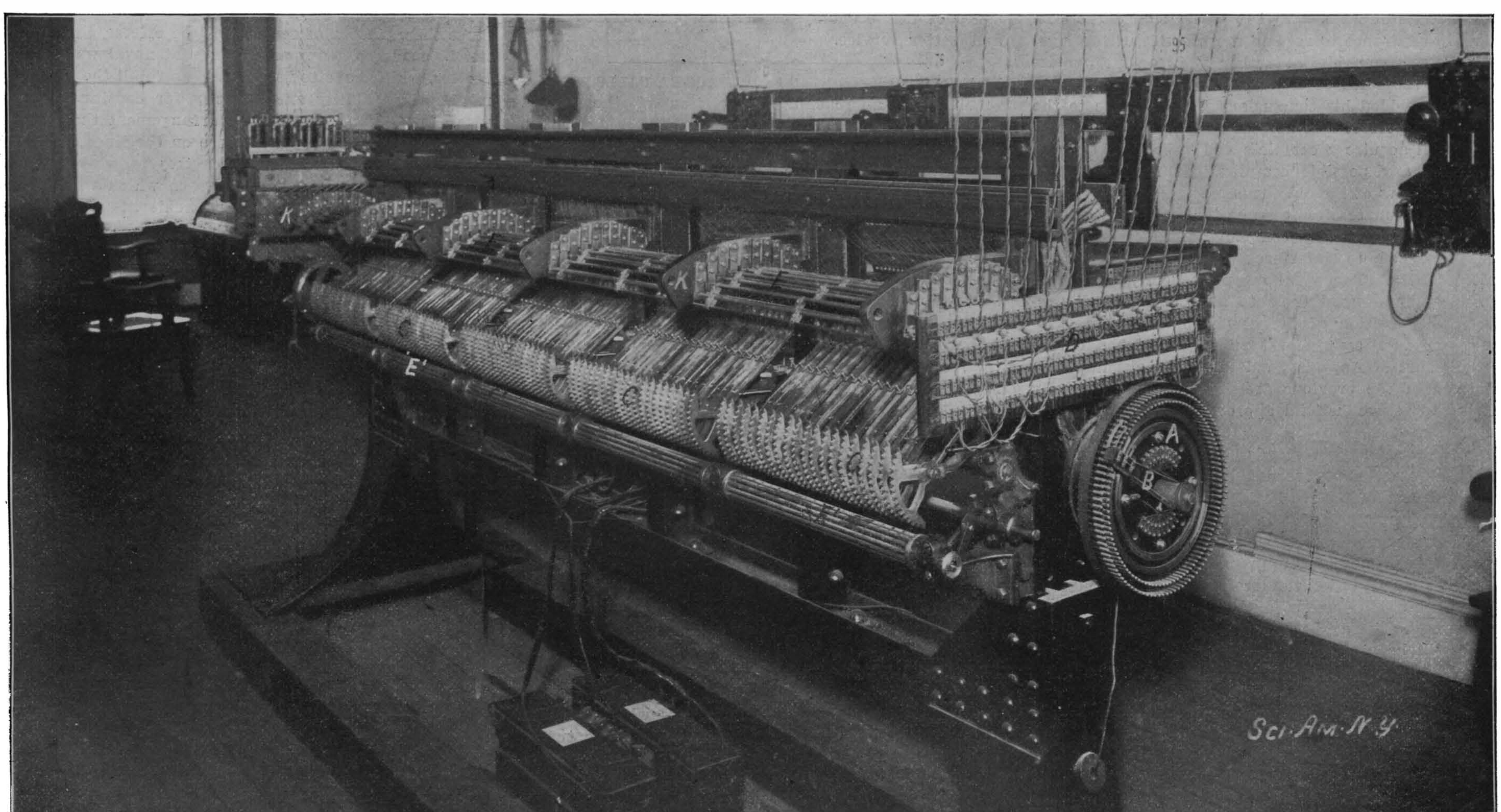
The "Busy-Wheel."



View from the Left.



The Subscriber's Outfit.



GENERAL VIEW OF THE FALLER AUTOMATIC TELEPHONE EXCHANGE.—[See page 238.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, OCTOBER 11, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

TITLES TO THE PANAMA CANAL.

The announcement that the titles to the property of the Panama Canal Company are unquestionably valid marks another important step toward the completion of the great waterway through the Isthmus. It will be remembered that during the final discussion in Congress on the question of the respective merits of the Nicaragua and Panama routes, the point was urgently insisted upon by Senator Morgan and some of his associates that the Panama Company could not possibly give valid title to their properties. To determine this question, Attorney-General Knox, assisted by the American legal adviser of the company, has been making a thorough search in Paris of the titles to the Panama holdings. The latter gentleman has recently returned to this country, and he announces that, during six weeks of consecutive examination, he prepared and delivered to Attorney-General Knox in Paris every conveyance, decree or concession relating to the properties of the canal company, from its inception in 1878 to the present day. The presentment showed a complete chain of title in the new Panama Canal Company, and its unquestionable power to convey the canal, plant, concessions and other property to the United States, free and clear of all liens or claims of any kind.

As the questions involved are governed by the law of France, the American representative of the canal company submitted his opinion to several of the most eminent lawyers of France, among whom was included two former presidents of the Bar Association of France, the French counsel for the new Panama Canal Company, the counsel for the liquidator of the old company, all of whom are among the leaders of the bar of France; and it is gratifying to learn that without exception these lawyers delivered opinions fully sustaining the titles and powers of the company. With a view to securing further indorsement of this opinion, the matter was submitted to such a great authority as M. Waldeck-Rousseau, who has just resigned the Premiership of France to resume the practice of the legal profession. From him a further indorsement was received in the form of a set of elaborate opinions, to which was added his conclusions that the title to the property is perfect and absolute, and that the United States will acquire a complete and valid title thereto, free from any possible complications from creditors or stockholders of the old company.

It is a fortunate circumstance that in February last a bondholder of the old company raised certain questions designed to interfere with the sale to the United States. The canal company boldly met these questions, and forced them to a decision which confirmed the position of the new Panama Canal Company; and an appeal taken by the defeated bondholder to the Court of Appeals resulted in the absolute confirmation of the previous decision, his action merely serving to secure judicial approval of the sale to the United States.

As the matter now stands, all questions involved in the transfer are governed by the law of France, and the courts of France have finally and conclusively adjudicated every question in favor of the new Panama Canal Company. It is now only necessary to conclude a treaty with Colombia in agreement with the Spooner law. The treaty is well under way, only three or four points being still under discussion. With the conclusion of the treaty between this country and Colombia it will be a simple matter for the United States to protect the strip of land over which it will acquire jurisdiction.

THE BRITISH GOVERNMENT AND THE SHIP COMBINE.

The long-awaited details regarding the nature of the great American and British ship combine and its relation to the British government have recently been made public by no less an authority than Gerald W. Balfour, President of the British Board of Trade, and incidentally an important letter has been issued by the directors of the Cunard Steamship Company, which is not in the combine, setting forth the terms of a subsidy which it is to receive from the government. With regard to the Cunard Company, the important announcement is made that the subsidy includes the payment by the government of $750,000 annually on the condition that the company builds two large, fast steamers of from 24 to 25 knots speed for the Atlantic trade. During the continuation of the agreement the Cunard Company is to hold its entire fleet, including any new vessels which it builds, at the disposal of the government; and the company agrees further that under no circumstances shall the management be in the hands of other than British subjects, nor shall the shares of the company or its vessels be so held.

With regard to the shipping combination, Mr. Balfour publicly stated at Sheffield that he believed Mr. Morgan had no intention of injuring British commerce or shipping, and that proof of this was found in his readiness to meet the government on all points upon which Great Britain's interests might seem to be most endangered. The Secretary of the Board of Trade further stated that an agreement had been arrived at with Mr. Morgan under which British vessels in the shipping combination would remain British, not merely nominally but in reality. The majority of the directors of the new combination in Great Britain were to be of British nationality, the vessels were to fly the British flag, while the officers and a reasonable proportion of the crew were to be of the same nationality. Moreover, the combination had agreed that at least half of the tonnage hereafter to be built for it should be built in England and sail under the British flag. The government was empowered to terminate the agreement, which was for twenty years' time, and was to be renewable by five years' notice from each party to it. In concluding, the Secretary of the Board of Trade said that it was his earnest hope that the arrangements thus announced would, while safeguarding British interest, be the surest foundation of lasting friendship between the two nations.

Subsequently it was announced on this side of the water that this great steamship combination is to be carried out under the name of the International Mercantile Marine Company, with a capital of $120,000,000. The president of the company will be Clement A. Griscom, and the directors and committees will be made up of a combination of leading American and British steamship owners of international repute.

The aims and objects of the combination are so well known to the public as to need no reiteration here. It is claimed that the companies included will be able to provide a greatly improved service and to regulate the dates of sailing so that they will be better distributed throughout the days of the week for the convenience of the traveling public, while it is expected that great economies will result from the operation, under a single management, of companies which formerly had no well-adjusted relations with each other. There is no question that the lines interested in the merger will be operated more economically, and the public will naturally hope that it will realize its due share of this economy in the shape of reduced fares and better service.

FURTHER DEVELOPMENT OF NIAGARA FALLS POWER.

With the approaching completion of the second power house of the Niagara Falls Power Company, and the construction of another great power plant on the Canadian side of the river, the development of the energy of the Falls is proceeding at something like the rate which was predicted many years ago at the time of the inauguration of the first Niagara Falls plant. The old station of the Niagara Falls Company contains ten 5,000 horse power turbines, giving an aggregate of 50,000 horse power; the output capacity of the second station will be 55,000 horse power. This will be developed by eleven turbines, operating eleven generators, each unit, as in the old house, being of 5,000 horse power capacity. The new wheel pit is 178½ feet deep, 18½ feet wide, and 464 feet long. It is excavated out of the solid rock and discharges into the great tunnel which was driven to serve as a tailrace for the first power house. The total length of the new power house is 560 feet, and its width is 70 feet. At its completion the plant of the Niagara Falls Power Company will be the largest in existence, having a total of 105,000 horse power, which is more than is actually developed by any of the great power houses in this city, although some of the latter, when completed, will exceed this figure.

The Canadian Niagara Falls Power Company has commenced work on its new plant, which will be located in the Victoria Park, about 1,500 feet above the Horseshoe Falls. Its general features will be similar to those of the American plant, its discharge tunnel opening through the cliff at the foot of the Horseshoe Falls. The power will be transmitted to Toronto and other Canadian cities that are within economic range, and to factories located on the Canadian shore. In view of the large ultimate output of the plant, and to secure economy of space and reduction in cost of development per horse power, it was decided to use units of the great capacity of 10,000 horse power each. The frequency will be 25 cycles, and the generators will be wound for 12,000-volt three-phase current. In addition to the economy of space there will be other advantages in the use of such large units, such as simplicity of operation, owing to the reduction in the number of units and the reduction in the cost of maintenance. For the present three generators have been ordered of the General Electric Company. They are of the internal, revolving-field, vertical-shaft type. The speed of revolution will be 250 per minute, and as a result the generator will be relatively small, its extreme diameter being 19 feet. The weight of the revolving portion of the machine is 141,000 pounds. It will be a considerable step from the 2,300-volt, two-phase of the American plant to the 12,000-volt, three-phase current of the Canadian plant; but this high voltage was selected because of the economy in distributing to power users located near the power house. For long distance transmission to different Canadian cities, the voltage will be raised to 22,000, 40,000 or 60,000 volts.

THE WATER-TUBE BOILER PROBLEM.

The report of the British Commission on the use of water-tube boilers for naval purposes will prove to be a most valuable document to every navy of the world. The high character of the Board of Experts who carried on the investigation, and the exhaustive and elaborate nature of the tests which were undertaken, render these conclusions practically final on this question. The committee admit the undoubted advantages of the water-tube boiler for naval purposes, and at the same time they point out the difficulties and risks attendant upon the use of it. They propose to find a way out of the dilemma by installing a combination boiler plant, to consist partly of cylindrical and partly of water-tube boilers, the cylindrical boilers to be used for cruising at ordinary speeds, and for the supply of the various auxiliary engines, while the water-tube boilers are to be considered as a reserve which is to be called upon only when extra speed is to be attained. The six new British cruisers of 22,000 indicated horse power are to have a fifth of their equipment, or 4,400 horse power, in cylindrical boilers, and the remaining 17,600 horse power, in water-tube boilers. The wisdom of this decision cannot be disputed, for, as a matter of fact, the period or periods during which one of the modern fast cruisers or battleships makes use of all its boiler equipment to secure its maximum speed, are very short and infrequent. It is quite possible that in the case of some vessels they will not for twenty-four hours out of their whole life be driven at their maximum speed. Except for the first high-speed acceptance trial runs, there are no occasions in times of peace, save possibly for a brief spurt during naval maneuvers, when the vessel is pushed to its full speed, and in war time the engines will probably only be called upon for their maximum effort for a few hours at a stretch. An additional advantage arising from this determination to reserve the water-tube boilers for high-speed runs is that, since their periods of service will be briefer, they need not be made so heavy as the present naval water-tube boilers, which have to be designed to fulfill the requirements of durability and capacity for continuous service. In fact, under the new arrangement the water-tube boiler can be designed more on the lines of those installed on the torpedo-boat destroyers, with a consequent saving in weight and space which will be of the greatest value to the naval architect.

POWER FROM OIL IN TEXAS.

Fuel oil has worked many strange improvements in the method of doing things in Texas and Louisiana since the Lucas gusher "came in" nearly two years ago, and it is destined to accomplish more wonderful changes, the latest and most striking of which has just been announced.

One plan has as its object nothing more or less than the turning of a comparatively unimportant section of a Texas county into a thriving center of life and activity through the agency of electricity.

Harris County is that selected, and the industry to be developed is the raising of rice on an immense scale, all the power to be supplied by electricity, even to flooding the fields, harvesting the crop, milling the rough rice, lighting and heating the homes of farmers, supplying heat for their cooking stoves and the power for transportation of product over a network of trolley car lines. In other words, almost every necessity and comfort of the people who will be brought in to settle this country will come to them through the agency of electricity. Fuel oil will produce the steam which will operate the central power plant, and through its use the cost of operation will be just about one-half of what it would be were coal or other fuel used, the oil fields being only a short distance away.

A ten-thousand-acre rice plantation, which cannot be irrigated under the system of surface canals now used, is to be equipped at an expense much less than

that at which water can be supplied through such canals in more favored sections.

Wells are to be bored, an abundance of water being obtainable at a depth of fifty feet or less in any portion of the rice belt, and the water drawn by electrically-operated pumps. Each farmer will have his own well and will be independent of his neighbors and of drouth, thus insuring an uninterrupted cultivation and a constant crop of rice. A centrally located power plant will supply power for the wells, rice mill, harvesting machinery, trolley lines, warehouse trucks and equipment, lights for the plantation roadway, store and dwelling houses, and possibly heat in winter time as well as the means of cooking all the year round.

Prof. Knapp, president of the National Rice Growers' Association, which has just closed its session in New Orleans, has long held that a solution of the costly plan of canal irrigation—receiving water supply from rivers and bayous—would be solved by the pumping process and be followed by an increase of 100 per cent in the rice output in Louisiana and Texas within five years.

THE WORLD'S VOLCANO RECORD FOR 1902.

The New York Times has compiled a most interesting and scientifically valuable list of the world's record of earthquakes and volcanic eruptions from April 10 to September 23. The list shows an almost continuous series of earthquakes, eruptions, tidal waves and lesser strange phenomena throughout the summer. Seismologically, the year has been one of the most remarkable recorded in history. The extraordinary eruptions of Mont Pelée and La Soufrière form only a small portion of the general disturbance to which our earth has been subjected. The list is as follows:

April 10—News received of volcanic activity at Unalaska, Aleutian Islands.

April 18—Earthquake in Guatemala, Mexico, Amatillan, San Juan, San Marcos, Escuintla and Santa Lucia, killing 1,000 persons, injuring 3,000 others, and rendering 50,000 homeless.

May 3—Mount Redoubt, in Alaska, erupts.

May 7—First eruption of St. Vincent.

May 8—First eruption of Mont Pelée, destroying St. Pierre and its 30,000 people.

May 12—Mount Colima, near Guadalajara, Mexico, becomes active.

May 13—Severe earthquake felt at St. Thomas, Danish West Indies.

May 15—Mount Soconusco, State of Mexico, becomes active, causing many casualties and a few fatalities in Aquespala, Laverga and Comitan.

May 18—Earthquakes in the southern part of Portugal.

May 18—Second eruption of St. Vincent.

May 20—Tidal wave destroys a portion of the village of La Carbet, Island of Martinique.

May 20—Basse Pointe, Martinique, inundated by mud.

May 21—Earthquake experienced at St. Augustine, Fla.

May 24—Mont Pelée resumes and continues with great force for several days.

May 28—Earth tremor registered at Bayonne, N. J., and at Chattanooga, Tenn.

May 30—Another eruption of La Soufrière, accompanied by a severe earthquake.

May 31—Sulphurous exhalations from Mount Trabochetto, between Nice and Genoa, Italy.

June 2—Announcement of eruption of Mount Blackburn, in southeastern Alaska.

June 4—The Gusygran, a mud volcano near the village of Kobe, in Caucasia, erupts, killing several persons.

June 4—Landslide, Mount Grigna, near Lake Lecco, Switzerland, kills two noted scientists.

June 6—Another violent eruption of Mont Pelée.

June 8—News received of the eruption of Tacana, in Guatemala, accompanied by violent earthquakes which razed many buildings in several towns. One thousand persons killed.

June 9—Columns of steam rise from Mount Rainier in Alaska.

June 14—Discovery of slight elevation of localities in Pennsylvania.

June 14—Still another violent eruption of Mont Pelée.

June 15—Strong earthquake shocks in Sicily.

June 19—Mass of slime ejected from Pelée, practically destroying the town of Basse Pointe.

June 20—Disastrous earthquake shocks in Tyrol.

June 21—Volcano Pichincha, in the Province of Manabi, in Ecuador, becomes active.

June 22—Violent earthquake shock at Cassano al Jonio, in the Department of Calabria, in Italy.

June 24—News received at San Francisco of the eruption of the volcano of Kilauea, near the city of Hilo, Island of Hawaii.

July 1—Earthquake shocks in Salonica, European Turkey, causing heavy loss of life and great damage to property. On the same day, also, earthquake shocks were felt simultaneously in twenty towns in Asia Minor, causing the collapse of many houses.

July 7—Large bowlders and gases ejected from Tulsa, a small volcano in the Indian Territory.

July 7—Guvesne and Zelisova, in European Turkey, partially destroyed by an earthquake.

July 8—Volcanoes of Miravallis and Ricond de water up the Harvey Canal, killing countless millions of fish.

July 8—Volcanoes of Miravallis and Ricond de Vieja, in Costa Rica, reported to be in active eruption.

July 9—Severe earthquake shock at Bunder Abbas, Persia, doing much damage.

July 9—Three severe earthquake shocks at St. Vincent, Danish West Indies.

July 10, 11, 12—Loud detonations from Soufrière volcano.

July 1—Fresh eruption from Mont Pelée.

July 12—Violent earthquake shock in Caracas, damaging towns of Guarenas, Guatire, Valencia and La Guayra.

July 17—Other severe earthquakings at Kingston, St. Vincent, Danish West Indies.

July 27—Destructive earthquake shocks in California, doing much damage to property in Los Alamos, San Maria, and Santa Barbara. Simultaneously a series of severe shocks was felt in Nebraska, the Dakotas and western Iowa, and did damage to property.

August 13-15, Japan—Eruption in small Island of Torishima; the inhabitants, 150 in number, disappeared, together with houses.

August 25, Italy—Mount Alto in eruption.

August 27, Philippines—Earthquake in the Island of Mindanao; sixty natives killed.

August 30, Venezuela—Earthquake shock at Carupano at 9 A. M.; disturbance accompanied by noise which was heard along the whole shore of the Caribbean Sea.

August 30, Martinique—Mont Pelée in violent eruption; said to have killed 2,000 people.

September 1, Martinique—Mont Pelée again active, the eruption surpassing in force that of May 8.

September 6, Italy—Vesuvius spouts flames.

September 8, France—Earthquake shocks at Pau.

September 8, India—Severe earthquake in Bengal.

September 9, St. Vincent—Contour of island changed by eruption of La Soufrière.

September 9, Greece—Stromboli in full eruption.

September 16, Mexico—Water spouted from a lake frightens Indians and whites.

September 17, Philippines—Macon, Taal and Balusan volcanoes unusually active.

September 22, St. Vincent—Violent eruption of La Soufrière; cable repair ship "Newington" working five miles from shore forced to steam away at full speed, effecting a narrow escape.

September 23, Jamaica—Sharp and violent earthquake shock felt throughout the island.

September 23, Ecuador—Severe earthquake shock felt at Quito, followed by violent storm.

TWO RIVAL AIRSHIP ASCENTS.

On September 29 E. C. Boice, in the airship which Santos-Dumont left behind him, made an ascent from Brighton Beach. The Santos-Dumont ship rose steadily to a height of about 1,000 feet and was headed for Sheepshead Bay. Hardly had Mr. Boice set off on his journey when Leo Stevens started upward from Manhattan Beach. Stevens' ship rose to a height of about 1,000 feet, headed due west, traveled about 1,000 yards, when the motor became disabled. The machine alighted on the top of a telegraph pole.

Boice had not much better luck. The Santos-Dumont was brought to a sudden stop because, as its navigator stated, one of its ropes fouled the propeller. The ship descended after having been in the air for about fifty minutes.

Stevens and Boice seemed to have their airships well under control. Boice sailed a mile and a half and landed in a vacant lot. Stevens succeeded in covering about three-quarters of a mile. During the trials an eight-mile wind was blowing from the northeast. Boice's trip from start to finish was almost directly in the teeth of the wind. Stevens, on the contrary, was compelled to drift along with the wind.

COLLIERS FOR THE BRITISH NAVY

The British Admiralty has introduced another new type of vessel into the navy, which, although not a war vessel in the strictest sense of the word, will nevertheless play an important part in a naval engagement. This new vessel, for which many firms have been invited to submit tenders, is described as a floating "coal depot," with a capacity of no less than 12,000 tons. The design of the ship is very ingenious, the hull being divided into two immense holds by an opening which extends all fore and aft, and from the double bottom to the deck. These holds are in turn divided by a lower deck, which leaves a space of about seven feet in height below it. Shoots are distributed all over the deck, and the coal in the main holds forces itself through them, with very little trimming, into bags fixed below them. When the bags are full they are conveyed by an ingenious device toward hoists in the central passage, and from the deck are loaded into the vessels alongside. It will be possible to coal two ships simultaneously by this method, and the supply will be continuous and speedy. It will thus be seen that the coaler is practically mechanical and will need very little attention. The British Admiralty contemplate equipping all the coaling stations with ships of this type.

SCIENCE NOTES.

In the course of an article on animal sense perceptions, in which special attention is directed to nauseous or offensive odors as a means of protection, the editor of the Zoologist warns his readers against regarding animal etiology too much from the human standpoint. Because animals cannot speak, we must not assume that they have no modes of communication; it is by no means certain that the ordinary explanation of "warning colors" is the true one, while the evil smell of the durian fruit does not render it distasteful either to the orang or to man himself.

There is on exhibition in London a large collection of relics of great archæological value discovered by Prof. Flinders Petrie, the famous Egyptologist, and Drs. Grenfell and Hunt, during the past year among the ruins of ancient Egypt. One of the most interesting relics is a specimen of headgear very similar to the present Panama hat in style, computed to be some 2,000 years old. The last year's exploration into Egypt's past covers every historical period of the country, but the most important scientific result has been the accurate connection of the prehistoric and the historic times. An unbroken stratified series of deposits, ranging over four or five centuries of the earliest kingdoms, has been found in a town which had the ultimate fate to be inclosed as the temenos of Osiris.

The death of Virchow, following the deaths of Pasteur, Helmholtz and Darwin, seems to leave the world without men of science as great as those it has lost. Great Britain, in the establishment of its new order of merit, has selected Lord Kelvin, Lord Lister, Lord Rayleigh and Sir William Huggins as the four students of science to be honored. In addition to Mr. Herbert Spencer, whose claims for recognition are somewhat different, Sir Joseph Hooker and Sir William Stokes may be placed in this group. When, on the occasion of Virchow's eightieth birthday last year, Lord Lister brought greetings from Great Britain, he was the only man whose work could be placed beside Virchow's; but while his method of antiseptic treatment in surgery has been one of the greatest advances in medicine, it is in some respects an isolated discovery, and can scarcely claim equality with the immense work accomplished by Virchow and Pasteur. Lord Kelvin is the only living physicist who might be ranked with Helmholtz. Darwin has no peer.—Popular Science Monthly.

THE CURRENT SUPPLEMENT.

The launch of the new White Star liner "Cedric" has been deemed of sufficient interest to warrant the publication in the current Supplement, No. 1397, of a well-illustrated descriptive article on the vessel from the pen of Mr. Harold Shepstone. The first American attempt at introducing the alternating current for electric traction on roads of standard gage is soon to be made on the Washington, Baltimore and Annapolis line. Since the single-phase current is to be used instead of the usual triple-phase, the road marks a radical departure in electrical railway practice. For that reason the paper by Mr. B. G. Lamme on the line may be regarded as of exceptional value. Prof. James Dewar continues his thoughtful history of cold and the absolute zero. Madame Curie in a brief note tells of the atomic weight of radium. Automobilists will doubtless be interested in a most copiously illustrated description of a novel fore-carriage built on the Riegel system. Mr. Otto F. Hunziker concludes his entertaining review of the existing methods of cultivating anaerobic bacteria. Numerous short articles and the usual Consular Notes and Selected Formulæ will also be found in the current Supplement.

A SICILIAN CYCLONE.

Dispatches from Rome state that a terrible cyclone swept over Catania, Sicily, and that the town was flooded. Many houses, including the Villa Bellini, have been damaged. The railroad suffered seriously. Mt. Etna showed signs of activity, and Stromboli was still erupting.

The discovery of niter deposits in Death Valley has started a rush to the perilous region. Five hundred men are waiting at Ballarat for information as to which portion of the desert is the best for prospecting. It is said that the deposits are as rich as those of Chile.

RAZING A BIG STACK WITH DYNAMITE.

BY GEORGE D. MITCHELL.

How to safely and expeditiously bring to earth a big brick smokestack 153 feet high, located facing the principal thoroughfare of the national capital, with many buildings dangerously near, was the problem that recently presented itself to the District of Columbia authorities.

About eight years ago the Capital Traction Company

RAZING A BIG STACK WITH DYNAMITE AT WASHINGTON, D. C.

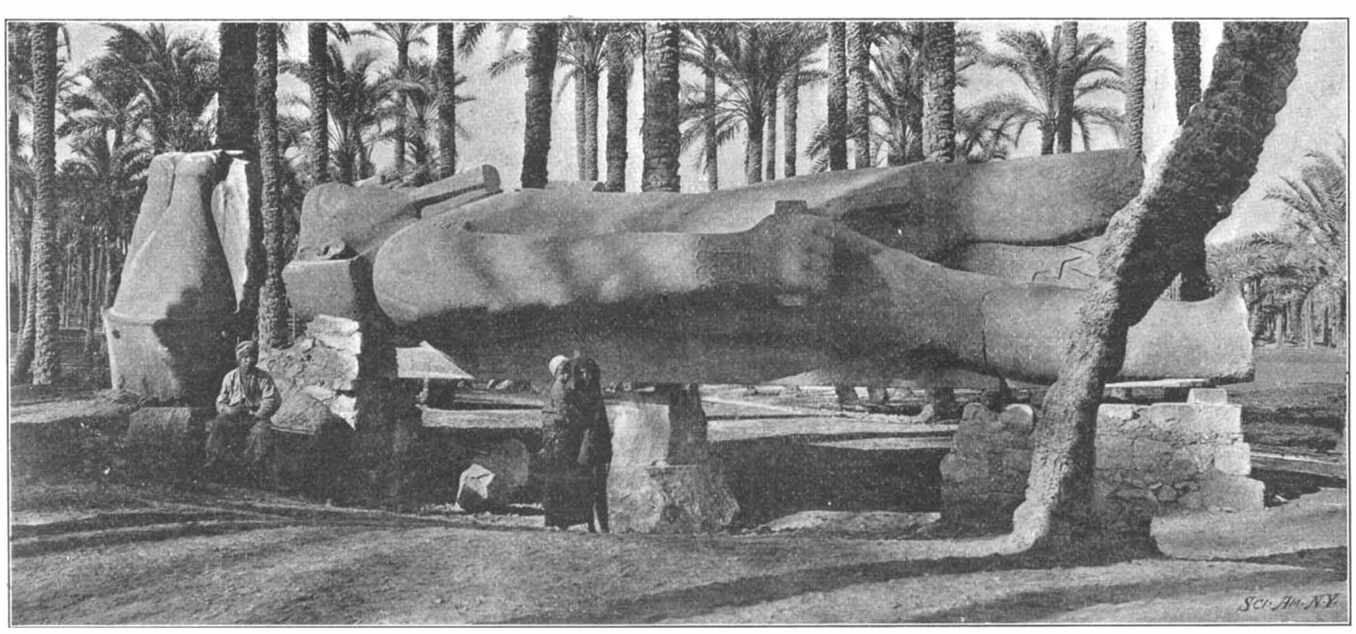
built a five-story cable power house in Washington, occupying the entire half-square between D and E and Thirteen-and-a-half and Fourteenth Streets, and facing Pennsylvania Avenue, near the National Theater, Willard's Hotel and other landmarks. The building was of quasi-fireproof construction, with timber girders, wood floors, partitions made of Southern pine covered with thin steel sheathing. It burned about five years ago, and the ruins were roughly cleared away after the fire, but the heavy engine foundations and the tall stack were left in place, and the site was abandoned by the company. Congress at the last session provided for the purchase of the ground as a location for a fine new municipal building for the District of Columbia. It was decided to clear off and level the site in time for it to be used in connection with the national encampment of the Grand Army of the Republic in October.

There was considerable stonework in the foundations, there were upward of 250,000 brick in the stack, and more or less loose material was scattered about on the ground. It was thought, on general principles, that the contractor who took the job of clearing the site should be willing to pay a liberal sum for the privilege in consideration of having this material; but as a row of buildings was situated only ninety feet away from the stack, just across D Street, and as there were other buildings on the other sides of the square, at distances of 200 to 400 feet, the authorities placed severe restrictions on the methods to be employed in razing the stack; and the result was that what was at first considered to be an easy proposition went begging for takers. There were a number of contractors who were willing to undertake the work on their own conditions, but finally the contract was placed with James L. Carrick, the only serious bidder, who had bid the modest sum of $60 for the privilege. The contract for demolishing the stack was sublet to Henry O. Brown. The stack was fifteen feet square at the base, with walls nearly three feet thick tapering to a thickness of thirteen inches at the top. The construction was carried square to a point about forty feet from the ground, where the third floor of the building had come, and from there it was octagonal, the interior being lined for about two-thirds of the way up with firebrick.

The district authorities had stipulated that the stack must be lowered by hand sixty feet before any explosives could be used on it. This was the main condition which hampered the undertaking, and it took nearly two weeks to take off the prescribed sixty feet, as the last thirty feet was an 18-inch wall.

In preparation for the final stroke the northeast and northwest corners of the base of the stack were undermined. Holes were drilled in the intervening sections of wall on the north side, and a series of half-pound sticks of dynamite were inserted. At the appointed signal the battery was thrown in and there was a deafening roar. For an instant the stack seemed poised bodily in the air, and then it began to fall directly across the vacant site to the north, as planned. It was not blown over by the explosion; the dynamite was used simply to blow out the supporting leg on the undermined side. The stack did not go over absolutely as a whole. It broke in several places, toward the middle, as may be seen in the snapshot illustration of the fall. That is to say, the lower part of the stack was the first to begin to fall, or give way, and the motion was not communicated instantaneously to the upper portion.

The débris was confined within a much smaller space than might have been supposed. Not a particle of material was blown away with any force by the blast, and the farthest brick fell only about 120 feet from the bottom of the stack. The bricks were deposited in a fairly regular wedge-shaped pile, comparatively few of them being broken. Nearly all those in the upper two-thirds of the stack were separate from one another, but the thick lower walls were left mainly in masses, up to five feet in length, the charge not being heavy enough to disintegrate them. Thanks to the careful precautions taken, there was no damage done to neighboring properties, and the work was a complete success throughout.



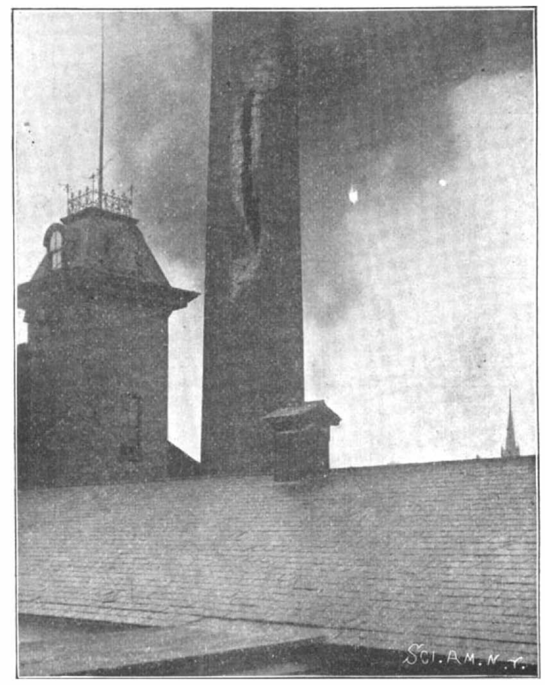
THE COLOSSAL STATUE OF RAMESES.

THE RAMESES COLOSSUS.

BY ALBERTA FIELD.

Among the many colossi with which Rameses II. adorned the different temples throughout his kingdom there is no more characteristic representation of this mighty ruler of the desert, according to our own ideals formed from our historic knowledge of him, than the mighty colossus of Memphis, which now belongs to the British nation. Raised from its Nile bed within the last few years, where it has lain face downward for centuries, reposing calmly beneath the waters of the sacred river save at the dry season, when it became visible until the inundation again buried it, it now rests high and dry above all dangers of high water, on heavy pedestals of stonework. Originally this figure stood on one side of the great doors of the magnificent Temple of Pthah, the ancient god of Universal Life or Artisan of the World, as he is called by Jamblichus, which temple Rameses II. further enriched with the colossi. The companion figure, however, which supported the opposite portal is absent, and its representation is shrouded in mystery, the mute but impressive lips of the recumbent statue holding firmly the secret thereof. In fact, there is but little evidence remaining of this temple, save great mounds of decaying and crumbling granite and conglomerate.

There is a marked facial resemblance among all of the stone representations of Rameses II. which is curiously noticeable on account of the difference of period and place of construction. The universal likeness predominates among the numerous bass-reliefs and colossi; from the youthful outline at Bayt-el-Welly to the older representations at Abydos, and so on to the caryatid colossi of the temples, the fallen statue of Bedreshayne, and the crowning glory of the magnificent colossus of the Ramesseum. The same boyish grace of features is followed in maturing lines, developing into the completed physiognomy of the older representations. The illustration fails to thrill one with an appreciation of the magnitude of this colossus, the estimated height of which is about fifty feet, the headcap or helmet alone measuring about nine feet,



EFFECT OF LIGHTNING ON A TALL FACTORY CHIMNEY.

and which is standing on a pedestal at the left of the illustration. The symmetry of the right arm is noticeable, as is also the firm grasp of the hand, which is characteristic of power.

CURIOUS EFFECT OF LIGHTNING ON A BRICK CHIMNEY.

BY ALFRED E. HALL.

At about half-past two o'clock on the morning of July 18, during one of the most terrific thunderstorms that ever visited the vicinity, the large brick stack of the Jamestown Worsted Mills was struck by lightning. This stack is 165 feet high and is capped by a heavy cast iron plate, but is unprotected by a lightning rod.

A large hole was torn in the chimney near the top, and the outer courses of brick were stripped and cracked for a distance of nearly half-way down. The bolt then jumped to the other side of the chimney, and there tore out a long vertical S-shaped gash, scattering the bricks in each case with a violence which broke them into fragments, and flung the fragments to a distance of two or three hundred feet, breaking windows and roofing slates in every direction. The further course of the lightning is not traceable.

The force which tore the brick out seems only comparable to the action of an explosive; yet the walls next the gashes were not broken or strained except for a short distance along the west side.

The factory was started at the usual time next morning. A careful inspection proved the stability of the chimney to be unaffected. A fine octagonal scaffold was erected, exactly conforming to the shape of the chimney, and the holes were all bricked in, leaving the structure in practically as good condition as ever.

The Municipal Art Society of New York recently held a competition for the best design of lamp post for use on the "isles of safety" to be provided on the more crowded of the New York streets at the junctions, as an aid to persons desiring to cross. The prizes were awarded as follows: First prize, $500, to Victor A. Ciani, New York; second prize, $100, to Henrik Wallin, New York; third prize, $50, to Wilkenson & Megonigle, New York; honorable mention, Edith W. Borroughs, Flushing, New York.

THE ELECTRICAL MANUFACTURE OF PEAT-FUEL.

The coal strike has brought us face to face with one of the most difficult economic problems of recent years. Compelled to pay about $25 per ton for anthracite and outrageously exorbitant prices for soft coal, the fact has been forced home that we have relied too much upon one kind of fuel. Texas is just now producing unlimited quantities of oil, but there is no way of shipping it cheaply at present to the Eastern States. Artificial fuel cannot be produced in sufficient quantities to meet the sudden large demand. We must perforce grudgingly burn either dearly bought hard coal or install smoke-consumers and burn soft coal. Coal and oil are not the only fuels in the world. The boglands of Europe and North America contain a wealth of good peat, practically untouched. The great moors of Austria-Hungary, France, Germany, Great Britain and Ireland could easily be made to supply a larger contingent of fuel than they do at present.

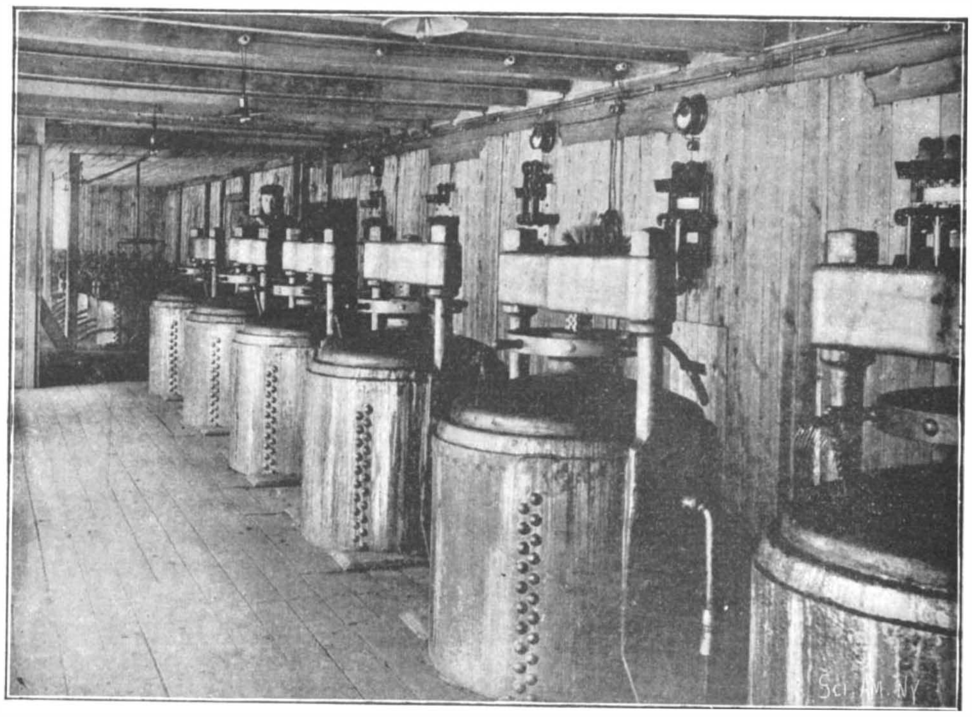
It is quite natural that technical experts make ever-increasing efforts to bring about the utilization of such immense natural supplies. The manufacture of peat-moss litter and of turf-dust has already been developed to a very remarkable extent, and the use of suitable kinds of peat for making textiles and hygienic articles, as well as the production of peat-molasses feed, etc., promises an increasing importance of the peat industry. However, the significance of all these efforts and of the successes which have been attained is placed far in the background, if compared with the importance of the peat after it has been worked into peat-fuel, and, above all, after it has been transferred into peat charcoal.

It is generally known that pressed peat has been in use for many years as a fuel. It is true that the heating efficiency thus obtained has been small, since the crude peat itself contains but from 30 to 50 per cent of carbonaceous matter and about 160 kilogrammes of machine-made peat have to be used for producing the heating effect of 100 kilogrammes of coal, while the space required for storing 160 kilogrammes of peat is three and one-half times larger than that occupied by 100 kilogrammes of coal. However, by transforming the raw material into peat-charcoal a heating efficiency is obtained equal to that of coal, and nobody can foretell as yet the various purposes, especially the technical purposes, for which the fuel thus produced may be utilized.

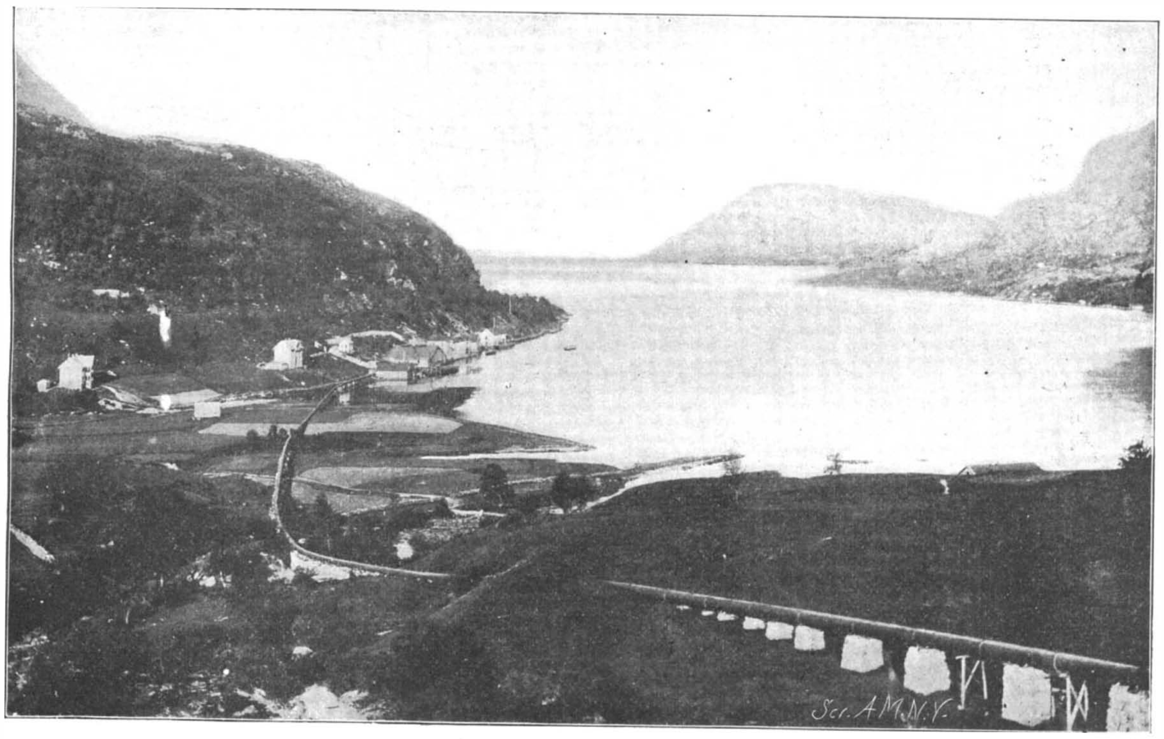
It must be admitted that not all kinds of peat are equally well adapted for the manufacture of a valuable peat-charcoal capable of proving a successful competitor. The latter possibility depends entirely on the one hand, upon the situation of the moor intended for the manufacture of peat-charcoal, and on the other, upon the physical and chemical qualities of the bog-peat which has to be carbonized. If a peat-bog is remote from means of transportation by rail or water, the expenses of bringing the peat from the moor and of shipping the coal will render the price of the peat-charcoal higher than that of the article obtained from peat-bogs which are more advantageously situated. A peat-bog, the situation of which allows the peat to be freed from water by a more thorough, as well as natural, and consequently inexpensive method, will offer better prospects of profit than peat-bogs having no outlet for the water; the latter yield very moist peat, so that more expensive drying plants have to be erected if the protracted air-drying process which would hinder the development of the works to a very considerable extent were not employed. It will readily be understood that the question as to the physical and chemical quality of the peat, which has to be used, is of the same importance.

Notwithstanding all the favorable chances for utilizing and selling peat-charcoal and in spite of the fact that the high price of bituminous coal, and above all of charcoal, increases from year to year, the rational utilization of the peat-bogs is as yet in an embryonic condition. This remarkable state of affairs is explained by the fact that the methods for carbonizing peat, which have been hitherto in use were far too expensive. All kinds of drying apparatus and a large variety of oven constructions have been used without, however, increasing considerably and permanently the output of the plant. This increase is the more indispensable for rendering the peat-carbonizing works profitable, as the period during which they may be operated, without interruption, can be estimated at from 200 to 240 days per year at the most. A new process for carbonizing peat yields better results. It is the invention of P. Jebsen, of Dale, Norway. The process has been in actual operation for three years in the peat-charcoal works of the inventor at Stangfjorden, Norway, with entirely satisfactory results. According to the invention, the partially dried peat-briquettes are carbonized in hermetically closed retorts by electrical heat, it being possible to heat several retorts at the same time with one dynamo machine. The dynamos are driven by water power with the aid of turbines. The process allows the peat blocks to be carbonized within a proportionately much shorter time and with much more uniformity, while the peat-charcoal produced consists of a dense, very compact black mass showing the structure of peat. The specific gravity of the carbonized fuel in the broken condition is about 0.3, and the theoretical calorific value about 7,000 to 7,500 thermal units. The peat-charcoal produced according to the Jebsen process burns well. It ignites readily throughout, spreads rapidly an intensive heat and yields but little soot. The ash is similar to that of bituminous coal; it does not affect, to any considerable extent, the fuel which is not yet consumed, neither will it cover the fire and prevent it from burning, like the ash of ordinary coal and of lignite. The analysis of Jebsen's peat-charcoal, made by the Royal Norwegian High School in Christiania, gave the following mean composition:

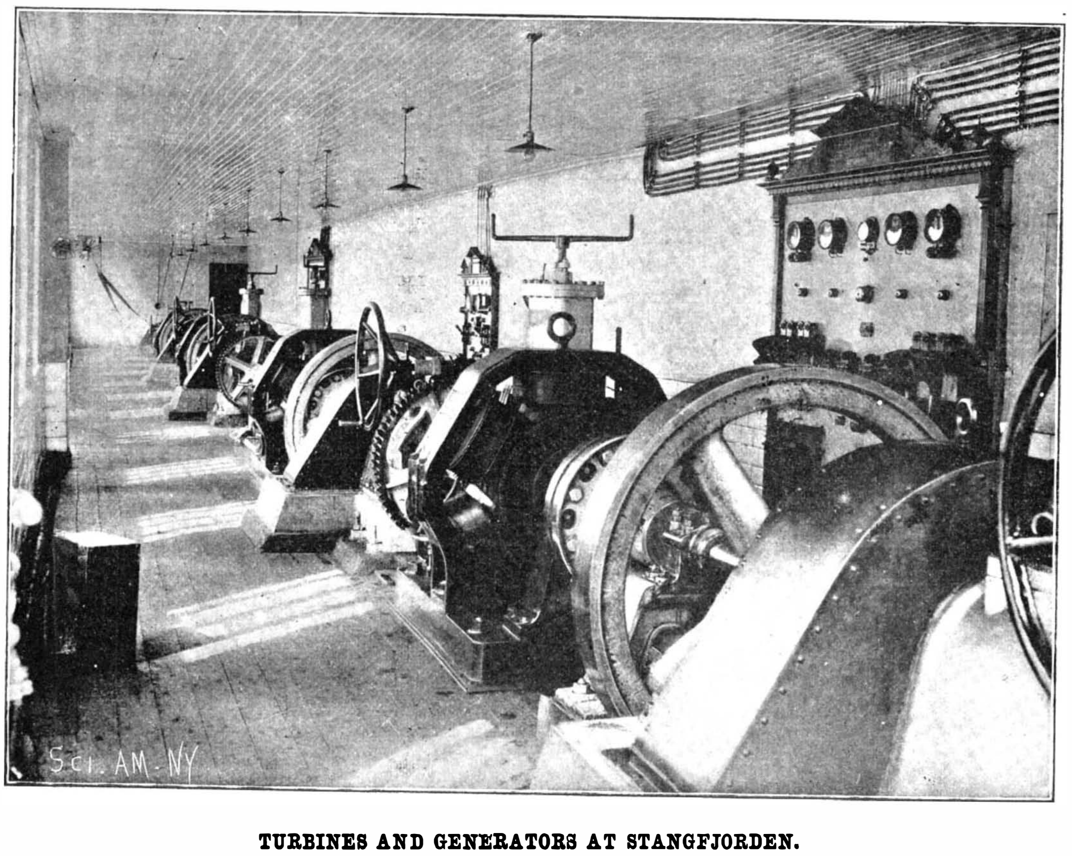
	Per cent.
Carbon	76.91
Hydrogen	4.64
Oxygen	8.15
Nitrogen	1.78
Sulphur	0.70
Ash	3.00
Moisture	4.82
	100.00



THE RETORT-ROOM IN THE STANGFJORDEN PLANT.



THE PLANT AT STANGFJORDEN, SHOWING THE PIPE-LINE.



TURBINES AND GENERATORS AT STANGFJORDEN.

The power required for carrying out the Jebsen treatment at Stangfjorden is derived from five 80-kilowatt dynamos direct coupled to five turbines of equivalent—128 horse power. The power generating installation was provided by Schuckert and Co., of Nuremberg. The wet peat is brought to the factory direct from the bog by water, in lighters of about 100 tons capacity. The boats are discharged by aid of mechanical power, and the peat is submitted to the first drying and pressing operation. This is carried out in a 5 horse power press which can turn out 2,500 pressed blocks of peat, each measuring 80 by 8 by 8 centimeters, per hour. The average weight of dried peat in each of these blocks is 2 kilos.

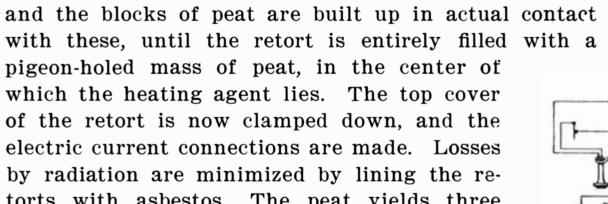
The briquettes of pressed and partially dried peat are next loaded into trolley shelf wagons specially designed for tunnel drying by an American company. Each wagon carries, when fully loaded, 140 of the wet briquettes arranged on ten shelves. The trolley wagons are pushed, when loaded, into the cooler end of the drying tunnel. The air draught which passes through the tunnel is set in motion by fans electrically operated, and is heated by the waste gases from the retorts. The air has a temperature of 90 to 100 deg. C. at the top end of the tunnel where the wagons emerge, and one of 40 to 50 deg. C. at the lower end where they enter. As the wagons pass up the tunnel, the peat is, therefore, submitted to a gradually increasing temperature. The drying plant at Stangfjorden comprises one hot air stove, three electric fans, two tunnels, and 102 shelf wagons; 1,000 of air-dried peat blocks can be produced per day. The wagons with their charges of dried peat are next taken on tram rails direct into the retort house and are emptied directly into the retorts.

The retorts are upright cylindrical vessels of iron, about 2 meters in height and 1 meter in diameter. Each retort has a removable cover, and a discharging hole below, and is in addition provided with gas exit pipes and a pressure gage. The retorts are provided with spiral resistance coils of special construction, and the blocks of peat are built up in actual contact with these, until the retort is entirely filled with a pigeon-holed mass of peat, in the center of which the heating agent lies. The top cover of the retort is now clamped down, and the electric current connections are made. Losses by radiation are minimized by lining the retorts with asbestos. The peat yields three products when submitted to this electrical heating in closed retorts. The gaseous products pass away by openings in the retort cover, and after scrubbing are employed for heating the air used in the drying tunnels. The tarry liquid condensed in the gas pipes and in the scrubbers contains tar oils, ammonia and other compounds, and if the plant and technical skill are available, may be worked up for these products on the spot.

The peat fuel remaining in the retort after the carbonizing operation is completed is allowed to cool down to 130 deg. C. before opening the retort, and is then discharged direct into wagons running beneath the retorts. The peat-fuel produced at the Stangfjorden factory is shipped direct to Bergen, where it is said to meet with a ready sale. The average yield of 100 kilos of the air-dried peat at Stangfjorden is as follows:

	Per cent.
Peat-fuel	33
Peat tar	4
Tar water	40
Gaseous products	23

The diagram below shows the products which are obtained from the peat by dry distillation:



A Scotch Antarctic Expedition.

Although Peary and Sverdrup have returned without having found the pole, and report that nothing unusual is to be discovered in the frozen regions of the earth, the Scotch Antarctic Expedition, under the leadership of William S. Bruce, is to proceed to the Antarctic regions. The province to be explored is situated between the regions now under investigation by the Swedish and German expeditions. The chief object of the expedition is to specialize in oceanography, meteorology and zoology. Six thousand fathoms of sounding line will be carried, chiefly for the purpose of ascertaining whether there is any bottom in the region where Ross reported "no bottom." Aeroplanes and kites are also to be used for the purpose of gathering meteorological data.

FALLER AUTOMATIC TELEPHONE EXCHANGE.

A step into one of the busy New York telephone exchanges is enough to suggest to the inventive mind a great field for invention, and such has evidently been the effect on many a witness of these buzzing centrals, for no small number of patents have been granted on this subject of automatic telephone exchange. In most cases the systems are too complicated to be practicable and comprise a great maze of wires, magnets and contacts which entail a considerable expense for installation and repairs. One man, however, has branched off from his fellow inventors in a very important detail. His system, instead of being electrically actuated throughout, makes use of mechanical means almost entirely in its operations, so that a great many of the contacts and wires necessary even in a manual exchange can be entirely dispensed with in this system. Furthermore, this system can be installed without disturbing the subscriber's telephone or materially interfering with the business of the exchange, and it is a straight, central energy system throughout. An important feature of this machine, and one that distinguishes it from all others, is that the central terminal of each subscriber serves both for calling and for being called. All the subscribers' lines terminate at central in similar terminals which are connected by cord circuits just as in the manual system. This is obviously a great improvement on systems which use separate terminals for the calling and for the called subscriber.

A better understanding of the system can be obtained from the following description. The machine illustrated is designed for a hundred subscribers. The subscriber's outfit consists of the usual apparatus, to which is added an instrument termed the "sender." This consists of a small case in which are a couple of dials, each bearing figures from 1 to 10 along its periphery. The dial on the right is the units dial, and that on the left is the tens dial, so that any number up to a hundred can be made to appear through the window in the casing. For larger exchanges dials are added, so that any desired combination of numerals can be made. To illustrate the operation of the system, we will suppose, throughout the following description, that subscriber No. 55 desires to call up subscriber No. 54. The first act of the calling subscriber is to turn the right thumb nut until the figure 5 appears, and the left until the figure 4 is shown through the window. The operator then turns the central knob, shown in our illustration, to the right. This winds up a coil spring which provides the motive power for sending over the subscriber's wires a series of impulses corresponding in number to the figures on the dials. This is more clearly illustrated by reference to the diagram. The tens and units dials are secured to disks a and b respectively. These disks are reduced in diameter over a portion of their circumference, so as to clear a number of contacts arranged radially about each disk. In turning the number dials to 54, the tens disk, as shown, is brought into engagement with five of these contacts, and the units disk with four, so that when the motor spring is released the brushes c and d are operated under control of the escapement mechanism to sweep over a series of contact pins, thus successively grounding the two subscribers' wires. The longer arm, c, in passing over the tens contact pins will send five electric impulses over the wire, e, and similarly the brush, d, will send four impulses over the wire, f. On winding up the motor spring, however, it is necessary to delay the sending of these impulses until such time as the machine at central is ready to receive them. For this purpose the escapement is normally held in check by the armature of a magnet, g, until central is ready for the signal, when the magnet, g, is energized, and its armature withdrawn from engagement with the escapement. When the motor spring of the sender is wound up, the contact at h and i is automatically made, which grounds the line wire, e, and permits a flow of current.

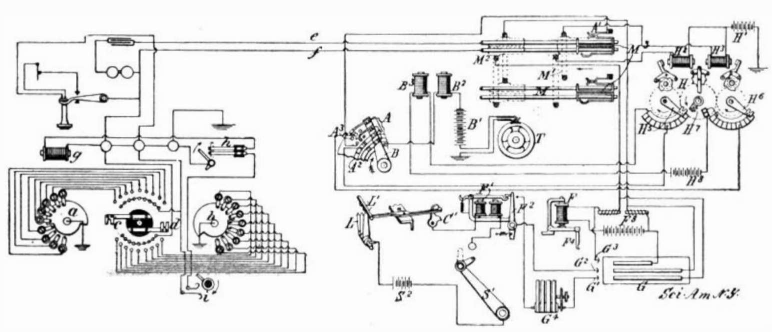


DIAGRAM OF THE CIRCUITS OF THE AUTOMATIC TELEPHONE EXCHANGE.

The machine at central is provided with a series of rods, M, a pair for each subscribers' pair of wires. A carriage, M^3, is adapted to travel over each pair of rods, and carries the subscriber's terminal springs, which are insulated from each other, but are each in electrical contact with their respective legs of the subscriber's line. Normally these carriages are in the position shown in full lines, so that an unbroken circuit is formed over a wire, e, through the carriage and connection, A', to the subscriber's contact or pin 55 on the rotary contact-maker, A. This contact-make consists of two sets of circularly disposed contact-pins, each set containing as many pins as there are subscribers. The trailer, B, which is normally rotating, sweeps over these contact-pins and connects them successively with two contact-rings. As soon then as the trailer comes into contact with pin 55 of the inner circle of pins, the circuit is closed through ring, A^2, magnet, B^2, battery, B^1, and resetting wheel, T, to the ground. The magnet, B^2, being thus energized attracts an armature which stops the rotation of the contact-trailer and trips a clutch which starts the power mechanism. The resetting wheel, T, of the power mechanism prevents the call from some other subscriber from being sent in while a switching operation is going on, for the circuit is broken at all times except when the power mechanism is idle. Rotating with the contact-maker is the "busy wheel," L, which is very clearly illustrated in one of our views. It consists of a series of resilient, radial fingers, mounted on and disposed about a shaft to form a helix of one turn. These fingers, corresponding in number to that of the subscribers, are so arranged that when the contact-maker stops at pin 55 the finger which is in line with the carriage, M^3, of subscriber 55 will be in vertical position. Parallel with the axis of the busy wheel, and placed just above it, is a rack, L', whose teeth normally lie between the paths of the busy wheel fingers. Now when the busy wheel stops and the power mechanism is started, this rack is moved laterally under action of a cam, thereby bending finger 55 with which it will come in contact. On account of the spiral arrangement of the busy wheel, only a single finger—that in the vertical position—will be engaged by the rack. Adjacent to the path of each finger is a latch which locks a corresponding shuttle in the position of rest. Springing the finger No. 55 axially results in a release of this latch and in the dropping of shuttle No. 55 to its operating position, thus bringing the carriage with which it is connected into the selective position shown in dotted lines in the diagram; the shuttles are shown at C in our illustrations. In this position the line spring terminals are brought into contact with the power bars, M', at the same time breaking connection with the rotary contact maker. This done, the power mechanism, having made a partial rotation, automatically throws itself out of operation and restarts the busy wheel. All this is the work of a few seconds. Current now flows over line, f, of the calling subscriber, through the magnet, g, and springs, h, to the ground. Magnet g attracts its armature and permits the contact-maker of the sender to rotate, thus sending the series of impulses over wire, f, as previously described. This rotation completed, the parts are restored to their normal positions and the circuit through the sender is broken.

The electric impulses sent by the contact-maker are generated in battery, H', and in passing over both legs of the metallic circuit energize the magnets, H^2 and H^3, causing them to oscillate their armatures. These armatures, as shown in the diagram are connected to an escapement mechanism which permits the selector brushes, H^5 and H^6, being operated by a coil spring, to sweep over and short-circuit their respective series of contacts. We will remember that the number of the called subscriber was 54, therefore the tens impulses passing over line, e, will cause the armature of the magnet, H^2, to oscillate five times, bringing the brush, H^5, over contact 5 of the tens selector, and similarly the units impulses will permit the brush, H^6, to travel as far as contact 4 of the unit selector. Between these selector brushes is a timing-train, controlled by an escapement, which is released when the brushes begin to move, and rotates the brush, H^7, until it short-circuits the contacts of battery, H^8. The contacts of the tens selector are connected respectively with ten ring segments, A^2, while the units contacts are connected with the outer row of pins, A^3, of the rotary contact-maker, A. These pins, A^3, are divided into ten sections corresponding in position to the sections of A^2. The pins in each section, however, which represent the same numbers, are connected with each other, i. e., every first pin of the tens sections is connected to one circuit, every second pin to another, every third pin to still another, etc. Contact 1 of the unit selector is therefore connected to every pin 1, contact 4 to every pin 4, etc. Now as the trailer, B, sweeps over these pins it will engage successively several pins, 4, but no current will flow until it enters that section of A^2 which is in connection with contact 5 of the tens selector, and then when pin 4 is reached, the circuit of battery, H^8, is completed. Following out the diagram, it will be seen that the magnet, B^3, is now

energized, and its armature is raised, together with the armature of B^2, to which it is mechanically connected. This action, just as when B^2 was energized, results in stopping the busy wheel, starting the power mechanism and dropping shuttle 54 into the selective position. It further permits the power mechanism to complete the rotation begun under action of the starting magnet, B^2, and to return to its normal position, when it will automatically stop, re-establishing the ground circuit at battery B' through wheel T.

In completing its rotation, the master shaft performs a number of operations which are about to be described. Two shuttles, 55 and 54, have now been dropped. These shuttles, as shown at C in our illustrations, are each provided with a toothed sector which when the shuttle is dropped, engages the pinion, E', at the front of the machine. The opposite ends of the shuttle are connected to the terminal carriages of the subscribers, which, as before stated, are brought into contact with two power bars, M', running at right angles to the bars, M. The power mechanism now permits E' to rotate, thus throwing the upper ends of the shuttles forward under the shuttle-rods, E, the carriages being drawn forward with them along the rods, M. Just above the selector mechanism, shown in the left-hand end view of the machine, a series of oscillating stops may be seen arranged in the arc of a circle. A lever, S', sweeps along this arc, engaging the first stop in its course and throwing it out of its normal sweep. This lever, which is connected by gearing to the pinion, E', is operated in a forward direction by a weight hung from this pinion, and is returned positively by a cam which operates levers V and S, the latter being keyed to the shaft on which lever S' is secured. If the machine had been idle before our signal 54 was sent in, the first stop would be engaged and thrown up and the rotation of pinion E', and the two shuttles engaged would be thereby limited. This act brings the two subscribers' carriages in line with the first pair of conducting rods, M^2, which in this machine take the place of the cord and plug of a manual system. Had the second stop been engaged, the carriages would have been brought into contact with the second pair of rods, M^2. It will be noticed that only ten talking positions are provided for on this machine. This percentage has been found ample in manual exchange practice, for practically never do all subscribers desire to talk at once.

The next act of the power mechanism is to lock the shuttles in position, which is done by lifting them upward until the hooks on their upper extremities engage the rods, E. Our front view shows several shuttles thus locked. In oscillating its stop pins, the lever S' closes the circuit of the battery S^2 through the first of a series of ringer controlling magnets, F'. This circuit contains a shuttle-carrier, C'. Had our subscriber 54 been busy, this carrier would have been dropped so that no signal could be sent. We assume, however, that line 54 is not busy, so the controller magnets will operate to release lever, F^2. By this time the first of a series of controller disks, G, will begin to rotate, bringing their contact strips into engagement with the set of brushes shown in the view at the left-hand end of the machine. The brushes, G' and G^2, connect the ringer, G^1, in multiple with the subscribers' circuits and send each subscriber a signal. The brush, G^3, short-circuits the battery, F^3, through part of the rotation of the disk and permits magnet, F, to be energized, which prevents the clearing-out mechanism from operating. The subscribers now take down their receivers and begin conversation. This act reduces the high resistance of the subscribers' circuit by shunting the ringer of, say, 1,000 ohms and providing a path through the transmitter and receiver of about 75 ohms. A sufficient current therefore flows through magnet, F, to powerfully energize the same. This continues until the subscribers are through talking and hang up their receivers, which act again increases the resistance of the circuit and reduces the flow through the magnet, F, to such an extent that it drops its armature and permits detent, F^4, to drop to its normal position in front of a continually-reciprocating carriage. There are ten clearing-out magnets, F, one for each of the oscillating stops operated by a lever, S'. The detents, F^4, when dropped to their normal positions engage those oscillating stops which have been thrown up by a lever, S', and restore them to their normal positions. The shuttle locks are thus released and return to their positions.

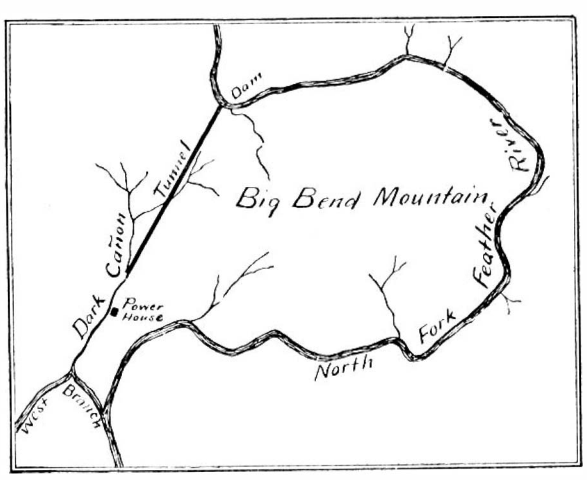
These operations, though seemingly numerous and complicated, are nevertheless automatically taken care of and consume but a few seconds of time. The instructions to the subscriber which are printed on the sender box are very simple, requiring merely the setting of the dials and the turning of the calling knob; it is not necessary to hold the receiver to the ear. In but a few seconds the subscriber's bell will ring and inform him that the connection is made. If the bell does not ring, he will know that the subscriber called is busy. Safety devices are provided in the sender which prevent an incomplete call from going in, and after the call is once set, the instrument is beyond the subscriber's control until the complete signal has been sent. Since the entire mechanism of the exchange is in the main mechanically operated, it requires but small battery power to energize the few magnets employed. A trouble test is provided, whereby any line which is out of order will immediately connect with the telephone of the wireman at the exchange. Any number of subscribers can be accommodated by this system, the requirements being simply an extra machine for every additional hundred subscribers. These machines are all joined to each other in such manner as to permit any two lines in the entire system to be connected together. The limited space at our disposal prevents us from enumerating the many advantages of this machine over the manual system, but these should be readily apparent to anyone acquainted with the tremendous complications of a large telephone exchange.

THE BIG BEND TUNNEL FOR POWER DEVELOPMENT.

BY FRANKLIN RIFFLE.

The recent incorporation of the Feather River Power Company recalls an ill-fated river-bed mining enterprise which for boldness of design, enormous outlay of capital, and barrenness of results, is certainly without a parallel in the annals of river-bed mining in the State of California.

In 1882 the Big Bend Tunnel and Mining Company was organized for the purpose of mining fourteen miles of the bed of that portion of the North Fork of the Feather River known as Big Bend. A careful survey had suggested the construction of a tunnel through Big Bend Mountain 12,000 feet long as the most feasible method of draining the channel. Owing to its precipitous banks, but few attempts (and these on a very small scale) had been made to mine this portion of the river. Both above and below Big Bend, however, mining operations had been carried on for many years wherever the water of the river could be turned from its bed by means of hastily-constructed wing dams and ditches or flumes. Only a portion of the summer season could be employed in actual mining, since much time was necessarily consumed in the construction of the diverting works, which were invariably destroyed by high water in the fall. Yet in spite of these drawbacks, many of the Feather River mining ventures had yielded handsome returns. It is chronicled that in 1857, on the old Cape Claim below Big Bend, the sum of $680,000 in gold was taken from 3,300 feet of the channel during the forty working days that intervened between the date of completing the diverting works and the appearance of high water. The expense of draining the channel and working the gravel amounted to $120,000. It was confidently assumed by the projectors of the Big Bend tunnel that the river-bed at Big Bend was equally rich in gold, and that the construction of a permanent channel sufficiently large to take care of the river flow for six months of the year would enable the company to mine more systematically, and therefore more profitably, than was possible with temporary diverting works, which could be utilized for only a brief portion of the season during which they were constructed.



PLAN SHOWING TUNNEL AND BIG BEND OF NORTH FORK OF FEATHER RIVER.

Active work on the tunnel began in November, 1882, after the completion of the necessary roads, trails and buildings, and the installation of an air compressor plant for operating machine drills. The material encountered proved to be slate, of such a character as to require no timbering; and, although hard and firm, it was excavated without difficulty. Excellent progress was made from the beginning, and the spring of 1886 witnessed the completion of the enterprise as originally planned. The cross-section was 9 feet by 16 feet throughout, except at the entrance, where it was enlarged to 9 feet by 32 feet. The grade was 30 feet per mile. Massive iron gates had been constructed for placing at the entrance of the tunnel, and a substantial diverting dam, 125 feet long and 16 feet high, had been completed simultaneously with the prosecution of the work in the tunnel. At this juncture the enterprise received a serious setback. When it was attempted to drain the channel, the startling discovery was made that the tunnel was much too small to carry the entire volume of water flowing in the river. After computing from accurate measurements the amount of surplus water, it was decided to increase the height of the tunnel from 9 feet, as originally designed, to 16 feet. Plans were made for pushing the work vigorously, with as many men as it was possible to work in three eight-hour shifts. By means of suitable cars drawn by a locomotive, the material was promptly removed as fast as excavated. The work continued without cessation until its completion in the fall of 1887—too late for mining that season.

It was now planned to develop sufficient water power at the lower end of the tunnel to operate the machinery required for excavating the gravel, viz., derricks for removing large bowlders and elevating the gravel to sluice boxes, and pumps for disposing of the seepage. A waterwheel and an electric generator were accordingly installed, and a transmission line was constructed around Big Bend. Fifteen years ago electric power transmission was in its infancy. As the Big Bend line was, therefore, largely experimental, it is not surprising that the results proved far from satisfactory. It may be mentioned as a matter of interest that this was chiefly due to the omission from the plant of an accessory which, in these days of successful power development and transmission, is considered a prime essential, i. e., a waterwheel governor.

The power plant, however, proved to be the least of the company's troubles. When mining was at last begun in the summer of 1888, it was found that the cost of excavating was much greater than had been estimated. This was due to the prevalence of large bowlders that could be handled only with the greatest difficulty. In addition to this obstacle, the bedrock, which had been relied upon to yield the largest values, was either inaccessible on account of the extreme depth of the gravel, or was too hard and smooth where the gravel was shallow to have accumulated gold.

Although the season's operations demonstrated the impossibility of profitably mining the Big Bend channel, the company were reluctant to accept the fact. Operations were resumed during the season of 1889; but the second attempt proving no more successful than the first, it was decided before the close of the season to abandon the enterprise. It is said that more than one million dollars were expended by the company during the eight years that elapsed between the inauguration of the project and its unfortunate termination.

And now comes the sequel. During the past five years the successful transmission of power, generated by water, from distant mountain streams to the towns of the Pacific coast has suggested industrial possibilities that were not even dreamed of fifteen years ago. The amazing success, not merely mechanically but commercially as well, of the Standard Electric and Bay Counties Power Companies in transmitting electric power from the Sierra Mountains to the cities on San Francisco Bay, 200 miles distant, has directed the attention of promoters and investors to all the available sources of water power on the western slope of the Sierras. One of the most promising is that secured by the Feather River Power Company, which has recently come into possession of the Big Bend tunnel property. At the end of the tunnel the water has a drop of 350 feet. It is estimated that this will develop no less than 2,500 horse power, making due allowance for loss in transmission to San Francisco, a distance of approximately 200 miles. The one feature of the Feather River power scheme that will appeal to both the engineer and the investor is the permanent character of the hydraulic portion of the plant. Fully to appreciate the value of this feature, it is only necessary to consider the enormous expense of maintaining the many miles of flume and canal construction that characterize certain large power plants in this State. The estimated cost of the entire plant, including the purchase price of the Big Bend Tunnel and Mining Company's property, is approximately $125 per delivered horse power.

When Big Bend tunnel was abandoned thirteen years ago, probably no one considered the possibility of turning the waste water power to profitable account, much less transmitting this power to the Pacific coast. At that time, as we have seen, the transmission of less than 100 horse power a few miles, and its application to the simplest operations, was attended with greater difficulties than the transmission to-day of many thousand horse power to distant points for distribution.

And so it has come to pass that the remarkable development of electrical science during the past few years has paved the way for transforming a disastrous mining failure into a brilliant commercial success.

EXPERIMENTS AT ST. CATHERINE'S WITH FOG SIGNALS.

BY H. C. FYFE.

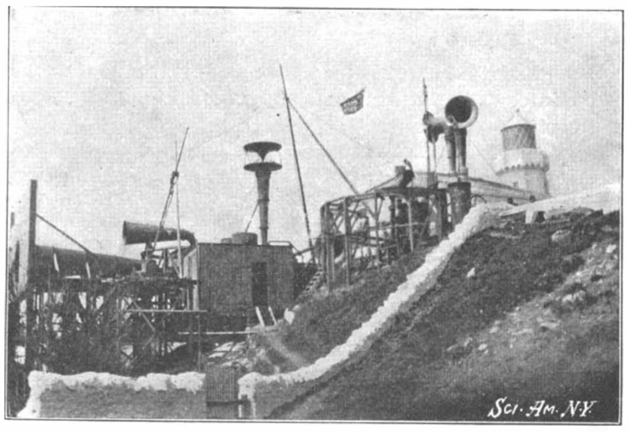
To guide the mariner during the hours of darkness elaborate and costly lighthouses have been erected on shore or on some rocky reef; lightships have been moored around the coasts, while thousands of floating buoys, illuminated by means of compressed gas stored in them, are used to define navigable channels or to mark dangerous localities. On a clear night such lights as these are of priceless value to the navigator; but when the grim and insidious sea-fog settles down over the face of the water, he is thrown back on his chart, his compass and his lead and is forced to advertise his presence with the foghorn, and to endeavor to discover his whereabouts by any sound signals that he can detect.

It being impossible to appeal to the eye of the navigator, his sense of hearing must be attracted by some sort of noise-making instrument capable of being heard at a considerable distance, and thus we find on every man-of-war, on every great liner and on vessels of lesser size and value various sound-producing instruments and also similar apparatus at points of vantage around the coasts of civilized nations.

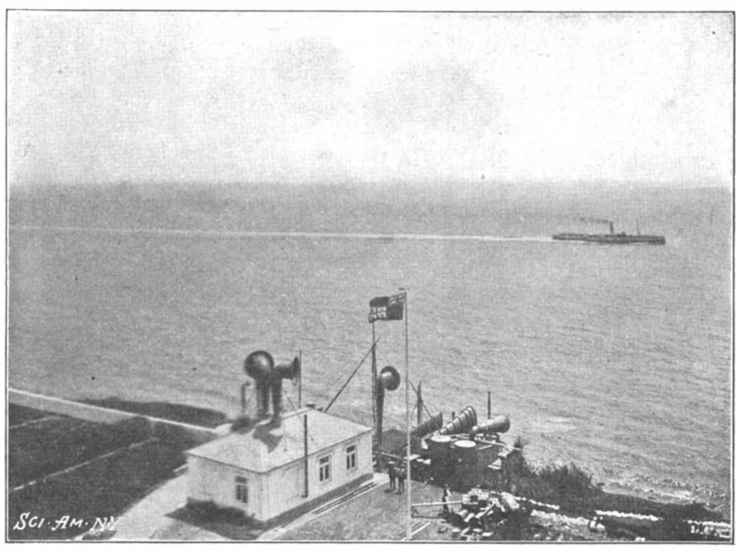
Of recent years noise making has (it has been remarked) been raised almost to a fine art, and every effort has been exerted to produce the most distinctive, the loudest and the most ear-piercing sound that can be developed.

During the years 1894-95 some very important experiments with sound signals were carried out under the auspices of the Trinity House Corporation with the aid of the late Prof. Tyndall, at that time scientific adviser to the corporation, at the South Foreland. It was then demonstrated that, contrary to the generally accepted opinion, fog offers no obstruction to the passage of sound through the atmosphere. The instruments for producing sound which were in use at this time were bells, gongs, whistles, guns, reed-horns and sirens, and the experiments proved that the siren was the best sound-producer, both as regards loudness, penetration and the power of overcoming opposing influences. Siren sound signals were accordingly adopted for the large majority of coast fog-signals set up on the coasts of Britain and other nations.

Since the 1894 experiments improvements have been effected in the various sound-producing instruments, and a few months ago the Trinity House, with the co-operation of the authorities for Scotland and Ireland, arranged for a new series of trials to be carried out at the fog signal station attached to the electric light establishment at St. Catherine's Point on Isle of Wight. A special committee of the board was appointed and with them were associated Lord Rayleigh, scientific adviser, and Mr. T. Matthews, engineer in chief to the Trinity House. Over 4,600 observations were recorded, the Trinity House steamer "Irene" steaming about in the vicinity of the station and recording the intensity of the sounds emitted by the various sound-producers used.



A Group of Fog-Horns.

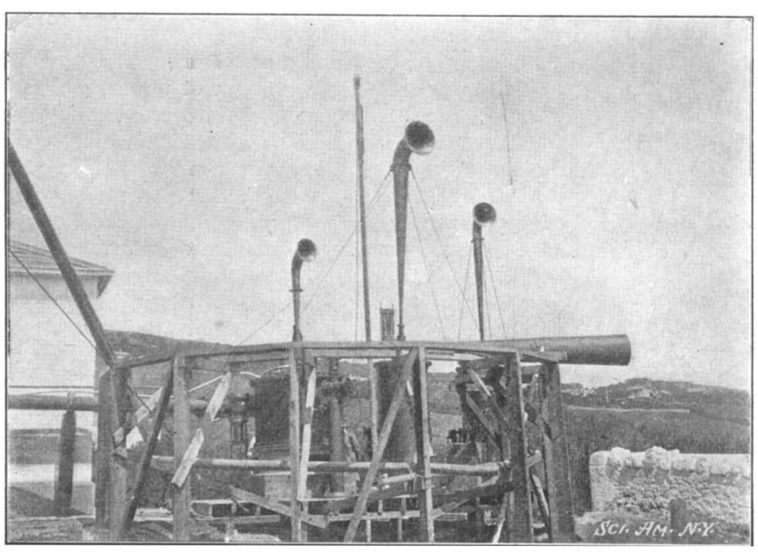


Signaling to a Passing Steamer from the Experimental Sound-Signal Station.

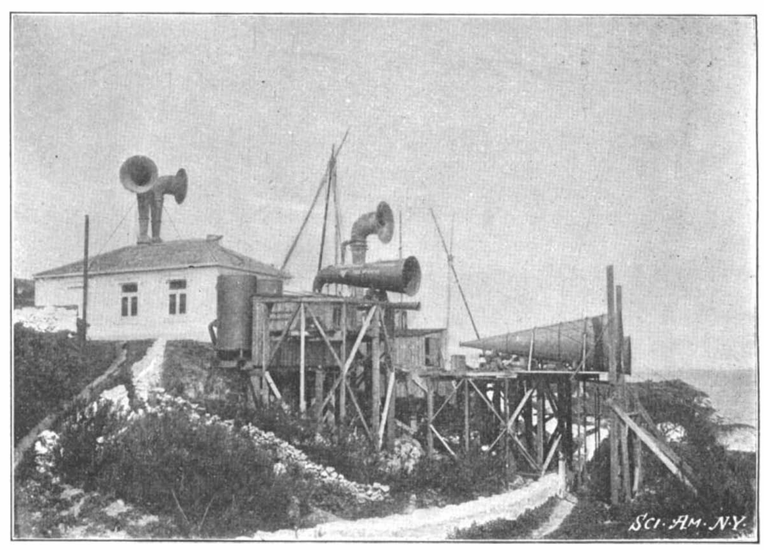
The instrumental tests were mainly devoted to comparisons of efficiency between the siren principle and the reed principle of producing sound and between modified forms of each type. Two sizes of cylinder sirens were tried; one of 5-inch diameter, as used in the Trinity House service; one of 7-inch diameter, as used in the Scottish service, and a new experimental form of disk siren 7 inches in diameter. Of the reed instruments four types were tried, viz., the Stentor fog-horn, the Barker reed-horn, the Taylor reed-horn and the Trinity House service reed-horn. Into the details of these different kinds of sirens and reed-horns employed it is impossible to enter, and we must content ourselves with a few of the more important conclusions. The committee reported that the siren was the most effective sound-producer for fog-signal purposes under all the conditions of wind and weather experienced and that reed sounding instruments as at present developed were much inferior and only suitable for guarding positions of secondary importance. A new form of siren trumpet with a mouth of elliptical section, devised by Lord Rayleigh, was found to work very well, and this form will probably be adopted. It should be observed that the musical note produced by the speed of rotation of a siren or by the vibrations of a reed should, to get the best effect, be in unison with the fundamental note of the associated trumpet. The conclusion arrived at by the committee was that a low-pitched note was most suitable for a fog signal.

In calm weather, they say, a low-pitched note is more suitable than a high-pitched one; but when the wind is opposed to the course of the sound waves or the sea is rough and noisy, a high-pitched note penetrates further than a low-pitched one. A very remarkable phenomenon experienced was the soundless zone or silent area, which sometimes existed at varying distances from the station. Outside this area, both in front and behind, the sound signals could be plainly heard, but once inside the zone they could not be detected. The experiments which we have so briefly summarized have yielded some very valuable results, and as they will be continued a few months hence, more results calculated to improve our fog-signaling appliances both on shipboard and along the coasts should accrue.

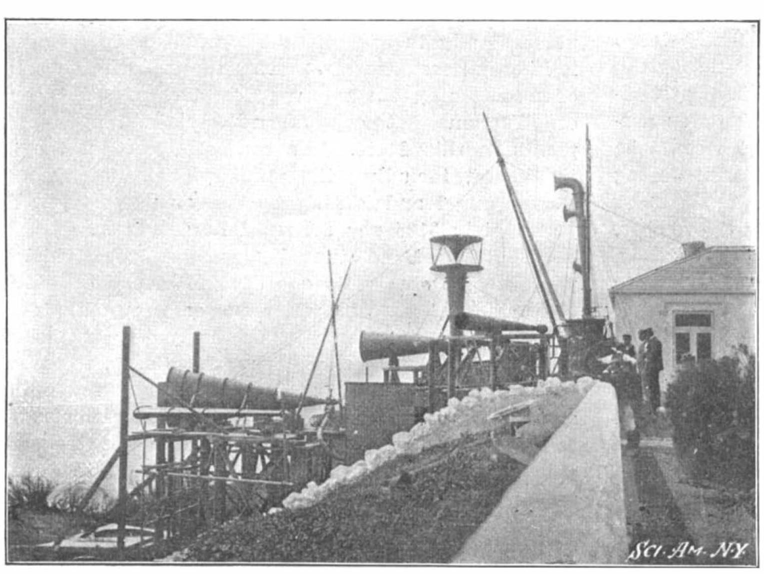
Sound—when all is said and done—is an imperfect medium for carrying signals to the mariner during fog. Perchance in the future some perfected system of syntonized wireless telephony or telegraphy will enable the navigators of to-morrow to successfully combat the fog fiend.



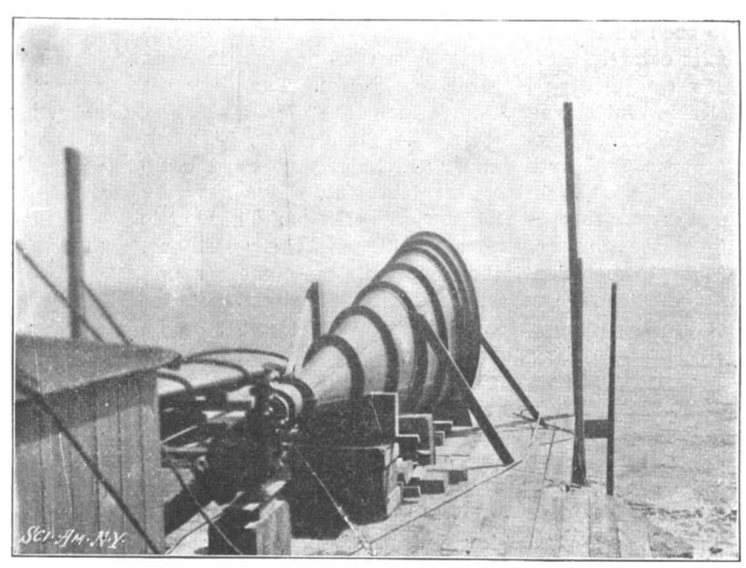
Reed-Horns at the Station.



Siren-Trumpets.



Siren-Trumpet and Reed-Horn. Lord Rayleigh's Trumpet in the Background.



Lord Rayleigh's Trumpet.

EXPERIMENTS AT ST. CATHERINE'S WITH FOG SIGNALS.

What are probably the two largest dining cars ever built were recently completed for the Chicago, Milwaukee & St. Paul Railroad, and now in service of the "Pioneer Limited" trains of that road. These cars are 70 feet over end sills, and 77 feet 11 inches over all. They are 10 feet wide over side sills, making them 4 inches wider and 6 inches higher from floor to ceiling than the standard palace car. These increased dimensions add considerably to the roomy effect of the interior and to the comfort of the passengers. Thirty-six people may be seated at the tables at one time.

THE CHINESE PRESS IN AMERICA.

BY CHARLES F. HOLDER.

In roaming through the famous Chinatown of San Francisco, its lanes and alleys, the stroller will perhaps observe over a narrow door a mystical sign, and beneath it the words Chung-Sai-Yat-Po, the daily newspaper; and if curious he may ascend the narrow stair and reach the editorial and other rooms of one of the several Chinese papers published in this Chinese-American city, Little Canton, as it is sometimes called. This paper was first started as a weekly, but was finally changed to a daily, and is now an influential organ of what might be termed the Americanized Chinese, or the New Chinaman, as the editor is a Chinese minister of the Presbyterian Church, a man of high cultivation from the American standpoint. He is the Rev. Ng Poon Chew, and one of his literary advisers and aids is John Fryer, LL.D., who fills the chair of Chinese Literature at the University of California; but the typesetters, the clerks, in fact all the employés, are Chinamen, some of whom are graduates of American schools. In the business office and editorial room there is little to attract the attention. American desks and chairs and telephone are the appliances of the workers; but when the visitor enters the composing room, a high, cheerless brick-wall-inclosed room, he is confronted with the fact that here as well as elsewhere in China things are upside down. In a word, the typesetter is quite as important a factor as the editor; at least such is the impression gained by the observer who faces the extraordinary cases of the Chinese compositor.

The American typesetter is obliged to be familiar with twenty-six letters, ten figures and a few signs and symbols, as periods, dollar marks, etc., but the Chinese compositor must be familiar with eleven thousand characters of this archaic language, about which Prof. R. K. Douglas says: "Every word is a root, every root is a word. It is without inflexion or even agglutination; its substantives are indeclinable, and its verbs are not to be conjugated; it is destitute of an alphabet, and finds its expression on paper in thousands of distinct symbols."

It is needless to go into a description of this marvelous language to explain the difficulties of the Chinese compositor; but one illustration is sufficient. Certain sounds often stand for several hundred words, the difference, often vital to an intelligent presentation of an idea, depending on certain diacritical marks accompanying each word. There are thousands of these symbols which are engraved, each one representing a type, but a well-regulated newspaper will require but eleven thousand characters; if others are needed they are made in the office. A font of type in the Chinese language requires eleven thousand spaces, and in the large and spacious racks here shown each word instead of each letter, as in English, has a place for itself. There is also a peculiar grouping or classification of symbols into groups to further facilitate the mental labors of the typesetters. Thus in the immediate vicinity of the symbol for fish would be found the symbols for scales, net, fins, tail, gills. This simplifies the labor, which in any event must be so strenuous that it is evident that the compositor's end of the Chinese newspaper should, if perfect justice ruled, be the highest paid.

The compositor is a staid and dignified individual, and as he slowly walks from symbol to symbol, picking up those which he requires with provoking calmness, the American compositor might well wonder when the work would be completed; and to set up the limited type required for a small four-page daily paper the constant labors of eight or nine skilled Chinamen are required for twelve or thirteen hours, the entire work in every department being the antipodes of the rush and whirl and marvelous celerity of the modern American publication.

When the paper is set up it is printed on an American press, but the type, the symbols, are all made in China.

There are three other newspapers published in San Francisco besides the one described—the Chinese World, the Oriental News and the Commercial News. Nearly all have some special object in view. Thus the World is a reform paper, virtually the organ of the Empire Reform Association, a club or society which is very influential in Chinese circles in San Francisco and said to include a fourth of the entire population. The World opposed the Boxers, is pro-American in its ideas; its editor is Tong Chong, a friend of the late missionary, Mr. Masters; a man of high culture and many attainments, who has, by the aid of the society, of which he is secretary, attempted to reform the entire Chinese nation. He hopes to accomplish this by educating the people up to a point where they will overthrow the Manchu power seated in the Empress, and with the Emperor upon the throne literally open China to reforms of all kinds. Tong Chong has found that even in America the path of the reformer is not over a bed of roses, as having aroused the enmity of the Manchu party, or that of the conservatives of the Chinese, the ultra-intolerants of reform, he has been confronted with the mailed hand of China more than once; and finally unable to reach him directly, his relatives in China were thrown into prison, charged with his crime—a lever by which the Empress hoped to change the policy of the Chinese-American journal which is virtually the organ of the muzzled Emperor of China. Native journalism in China is still in its infancy, so far as perfection of appliances is concerned, yet the Pekin Gazette is the oldest newspaper known, having begun publication nearly one thousand years ago; so long in the past that the "original copy" has disappeared; but the many modern newspapers published in the great cities of China suggest that the beginning of a new era has dawned.

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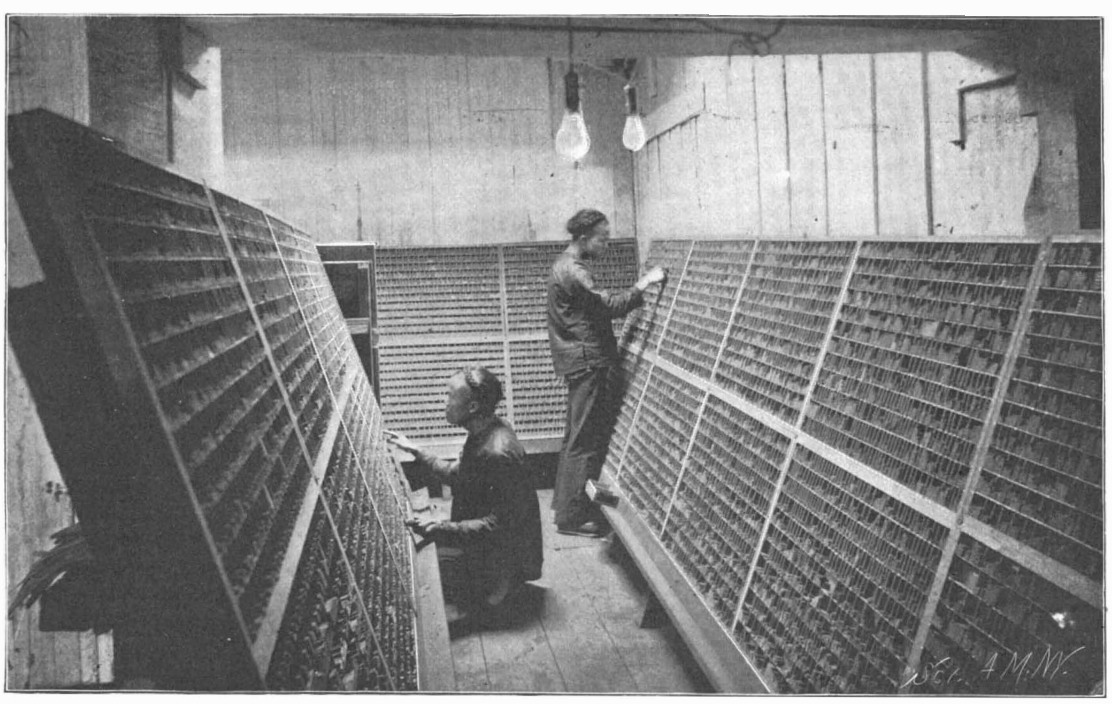
A SAN FRANCISCO CHINESE NEWSPAPER.

Two small synchronous A. C. motors, each about the size of an egg, the one mounted at the transmitting station, and the other at the receiving station, are driven by a current derived from the same generator, so that they rotate at exactly the same speed. The speed is about 30,000 revolutions per minute, or 500 per second. Such a velocity of rotation will no longer arouse much astonishment after the high speeds attained by the De Laval turbine.



INTERIOR OF CHINESE COMPOSING ROOM, SHOWING ENORMOUS SIZE OF THE FONTS.

Electrical Vision.

BY EMILE GUARINI.

A Belgian engineer whose name is not known has endeavored to solve a problem which has baffled many inventors. The problem in question is that of devising some means whereby it is possible to see electrically through long distances, just as we hear electrically by means of the telephone. The new invention is of unusual interest, since it employs but a single circuit to transmit the images. Although it is difficult to obtain full particulars of the contrivance, it is possible to give at least an outline of the principles which underlie its construction and operation.

Two small synchronous A. C. motors, each about the size of an egg, the one mounted at the transmitting station, and the other at the receiving station, are driven by a current derived from the same generator, so that they rotate at exactly the same speed. The speed is about 30,000 revolutions per minute, or 500 per second. Such a velocity of rotation will no longer arouse much astonishment after the high speeds attained by the De Laval turbine.

Each of the armatures at about its middle carries a small lens or objective. Although it turns with the armature, each lens is free to oscillate through five degrees from the axis of rotation. This movement of oscillation is effected about an axis normal to the axis of rotation, and is controlled simply by a double-threaded screw. A complete oscillation takes place for every 50 revolutions of the motor. Hence there are ten oscillations per second. At the transmitting station the lens is fitted with a screen or diaphragm so that only a small portion of its surface is exposed at a time. The image which is projected by the lens remains on a point of the axis of rotation. A selenium composition, the electric conductivity of which varies according to the intensity of the light to which it is exposed, is placed on the axis of rotation. The lens, rocking while its axis of oscillation turns about the axis of rotation normal to the former, may be said to "see" in space a spiral, the center of which is the prolonged axis of the electric motor, the spiral extending to an angle of five degrees entirely around this axis. The spiral is completed forty times per second. The objective, therefore, traverses forty times in each second the surface of the body to which it is exposed, provided that this body is not situated beyond an angle of ten degrees relatively to the transmitting body considered as the vertex of the angle. All the luminous rays successively emitted by all the points of the surface of the body the image of which is to be transmitted are thrown on the transmitting body. The current passing through the circuit in which this transmitting body is included, will vary at each instant with the luminous intensity of points to which the lens is successively exposed.

At the receiving station the circuit includes a conducting body, the luminous intensity of which varies instantly with the intensity of the current. The luminosity will, therefore, fluctuate with the quantity of light received by the transmitting body. This receiving body is placed in the principal focus of the lens, which turns and oscillates at the receiving station. Through the medium of this lens the luminous image of the receiving body is projected in the form of a spiral on a white screen placed before the lens. This luminous spiral which is traced forty times per second, through the same fluctuations as the transmitted spiral, reproduces the image of the body so rapidly that to the eye the picture is continuous.

In order to carry out experiments with the apparatus, absolute darkness is essential. The inventor, however, hopes to devise a means whereby it will be possible to project the image directly on the retina of the eye. He intends to place the receiving apparatus directly in contact with the eye.

A New Cure for Scarlet Fever.

At the Carlsbad convention a new cure for scarlet fever was announced. The honor for this discovery must be credited to Dr. Moser, the assistant physician at St. Ann's Hospital for Children, at Vienna. The cure consists in the utilization of a serum. During the last two years it was said that this serum has been tried on 400 patients, with a decrease of mortality to nine per cent.

Patent Department

AN IMPROVED PIANO RESONATOR.

The art of the modern pianoforte-maker receives too little attention from the musical critic. The reason is not far to seek. To be sure, the critic knows whether or not the tonal quality of the piano is good; but he knows little or nothing of the skill and the scientific knowledge which are required in perfecting an instrument which has attained such general popularity. For that reason the critic is apt to praise the virtuoso for qualities which he should more justly attribute to the piano itself.

The constant improvement to which the piano has been subjected during the last quarter of a century has not been without its effect upon the style of playing, as well as upon musical composition. Indeed, many of the works of our ultra-modern composers could never have been effectively performed on the pianos used by Chopin and his contemporaries.

One imperfection in the modern pianoforte, found even in the instruments made by standard makers, has been the loss in tone quality, due to the inability of the sounding-board to retain its tension. The problem seems at last to have been satisfactorily solved by a most simple and ingenious construction invented by E. A. and R. W. Gertz, and embodied in the pianos of Mason & Hamlin, of Boston, Mass.

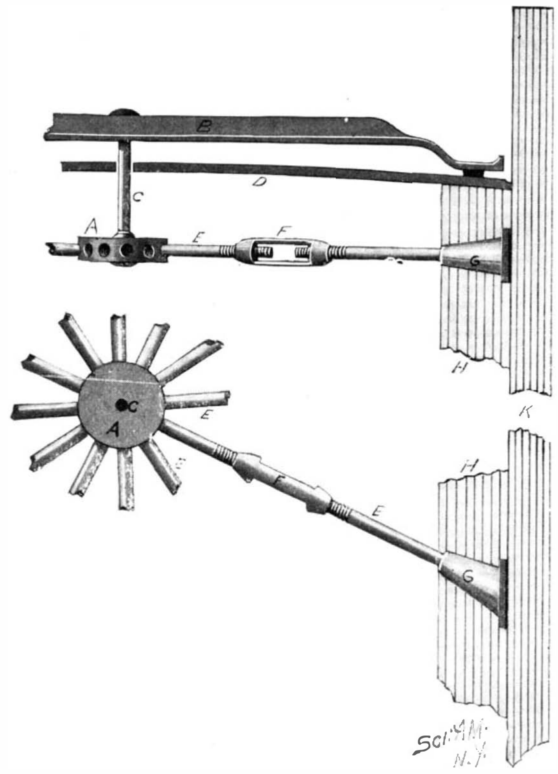
Doubtless the question has presented itself to many of our readers, Why is it that a violin improves with age and that a piano deteriorates? A comparison of the construction of the sounding-boards of the two instruments will give a satisfactory explanation.

The sounding-board of a violin has a permanent shape. The stiffening-post which is inserted within the instrument directly beneath the bridge, where the greatest strain is exerted, connects the board with the back and thus prevents a rupture of the board at its weakest point. The tense strings and the vibrant board are a unit in themselves, the strain of the one counteracting the strain of the other.

In the piano the case is different. The best pianos are provided with sounding-boards slightly arched, over which the strings extend. The strings being spread over the entire surface, must necessarily be on a straighter surface than on a violin, where the four strings bear upon a very small part only of the sounding-board. Therefore the tremendous strain of the strings on a modern piano has the tendency from the first to force down the arch of the board. In the very finest and most expensive pianos the strain of the arched board against the strings, and the strain of the strings against the arched board, is so finely adjusted that the one counterbalances the other. That is to say, the sounding-board is able to carry the strain of the downward-bearing strings, and at the same time is pliable enough to yield to the slightest vibration of the strings. If the sounding-board is too stiff and heavy only violent vibrations will affect it, and it will throw out only a blunt, dull sound. On the other hand, if the sounding-board cannot carry the strain of the strings properly there will not be the proper resistance, and the sound will be wiry and thin, "tinpanny," in other words. So sensitive is the wood to climatic changes that the piano sounding-board loses its shape very easily. Under certain conditions the sounding-board will expand, and the soft and hard fibers of the wood will be pressed together, which in itself results in no injury; under other conditions the sounding-board will contract so that it assumes a perfectly flat shape. Even if the board does not crack after contraction, as it often does, the loss of its original convex shape results in a great loss of tone, owing to its inability to bear against the strings as it once did. The result is a deterioration of tone in all pianos when old, no matter how finely they sounded at one time. Since the loss of shape is permanent, the loss of tone is permanent.

The wood being as good as it ever was, it follows that were there some means of restoring to the sounding-board its original convex form, so that it would bear upon the strings as it originally did, the tone would surely return. By means of the new construction, to which we have referred, not only is this much-desired end attained, but something more. The sounding-board bears with greater pressure and far more vitality against the strings than the necessarily thin sounding-board could in itself. This extra pressure against the strings, which the contracted board gets by means of tension rods, is entirely different from the rigid stiffness of a too heavily constructed board, and by this method the musical quality of the instrument is much improved. The tone is no longer merely a concussion sound, changing its quality and diminishing its quantity immediately after the key has been struck, but a clear resonant vibration of constant quality and size, of great singing capacity and of rare beauty. The quality of immediate responsiveness is not lost. It is no longer necessary to force the piano in order to obtain great sonority; for the instrument responds at once with little effort.

The construction by which these results are obtained is clearly shown in the accompanying illustrations.



DETAIL VIEW OF SOUNDING-BOARD RIM AND TENSION RODS

The sounding-board support of the instrument is a rim, H, which is made of a series of thin layers of seasoned wood, glued together and surrounded by the casing, K. Upon the rim thus formed the sounding-board, B, is firmly secured. For the purpose of regulating the compression of the rim, and consequently of adjusting the tension of the sounding-board, a series of tension members, E, is employed, radiating from a central disk, A. These tension members are thin metal rods, headed at their outer ends and passed through the rim. Each tension member is composed of two parts, which are oppositely threaded at their adjacent ends to receive turnbuckles or nuts, F. In order to adjust the tension of the rods, to draw upon

BOTTOM OF A GRAND PIANO, SHOWING THE TENSION RODS AND SOUNDING BOARD RIM, A.

the rim, and therefore to regulate the tension of the sounding-board against the strings, it is simply necessary slightly to rotate the turnbuckles.

To the mechanic it will be evident that the enormous strain exerted by the rim upon the tension members requires a peculiarly constructed head; otherwise the members would be torn from their fastenings, or at least would gradually slacken. The peculiar manner in which these heads are constructed is clearly shown in one of our detailed illustrations. Each head, G, consists primarily of two parts—a tapered foot and a plate so inclined that it lies flat against the rim. From this design it follows that the greater the strain upon the tension rods, the more securely are they held in place.

Every portion of the rim and the corresponding section of the sounding-board can be compressed and regulated as desired. When the sounding-board has been flattened out by reason of climatic conditions, and the piano has lost its old sweetness, a slight rotation of the turnbuckles is all that is necessary to arch the sounding-board up against the strings and to restore to the instrument the tone for which it was once admired. Furthermore, the distortion of the rim which occurs in most pianos is prevented, the tension members preserving the shape of the rim far better than the ordinary solid post construction. So great is the strain upon the rim that any tendency to relaxation which usually follows atmospheric and climatic changes can never affect the tension to any degree. The tonal quality is consequently retained indefinitely, so that the action is the only portion of the instrument which is subject to any wear—a defect easily remedied by a good mechanic. Since the piano can never lose its tone, it would seem that some of the qualities which are gained by violins with age should be acquired by the piano hereafter.

The construction is not untried. A piano fitted with this new resonator was used last year by Harold Bauer. The critics who commented upon his work praised him for the wonderful sweetness and singing quality of his tone, attributing the graceful effects produced to the early training which he had received as a student of the violin. No doubt much of the charm that graced Bauer's playing may be credited to interpretive skill, but much of it was also due to his instrument.

Brief Notes Concerning Patents.

It has been announced from Copenhagen that an American syndicate has made an offer of $600,000 for the rights of the company controlling the Poulsen telegraphone as well as an interest in the new company. The deal had not been consummated at last reports.

After a lapse of thirty years the estate of Samuel F. B. Morse has been distributed pursuant to a decree of the Supreme Court. The gross estate of the inventor of the telegraph amounts to $524,000. The management of the estate has cost so much that after deducting expenses there was left for final distribution only $346,000.

Cornelius Vanderbilt recently made a personal test on the Manhattan Elevated Railway of New York of a smoke-consuming device for locomotives in which he is interested. The inventor of the device is W. S. Hughes, of Philadelphia. It is said that the test proved how feasible it is to do away with the smoke nuisance on locomotives.

One of the contemporaries of Singer and Howe, Mr. James H. Whitney, died in Boston, August 28, at the age of eighty. Mr. Whitney was one of the first generation of prominent promoters of the sewing machine industry. His interest in the business began in the interval between Howe's invention and the succeeding era, when Singer and Wilson put the Howe and Bachelder principles in practical shape.

Some of the residents of the town of Spencer, Mass., proud of the distinction which that place bears in being the birthplace of Elias Howe, Jr., the inventor of the sewing machine, have erected an 18-foot sign along the tracks of the Boston & Albany Railroad which announces this fact to the passengers in bold letters which cannot avoid being seen by the passengers on the fastest trains which pass over that road. The sign reads as follows: "Down in the valley below Elias Howe, Jr., the inventor of the sewing machine and an illustrious son of Spencer, was born in 1819." After the words "Down in the valley" a huge hand points to the birthplace of the inventor.

Among the recent electrical inventions of interest is the self-ejecting telephone plug of Charles F. Butte, which will greatly reduce the work of the central station attendants and facilitate the service. The plug tip carries a sleeve which slides upon the shank of the tip and is normally pressed outward by a spiral spring contained in the handle of the plug. Upon pushing the plug into the jack this sleeve is forced back into the plug handle by the face of the jack and is caught by a latch pivoted near the center of the handle. At the rear end of the handle is a small electromagnet adapted to draw the rear end of the latch downward and release the sliding sleeve. This magnet may be connected with the clearing-out circuit, so that when the subscriber hangs up his telephone the magnet is energized and draws the latch downward; the spiral spring then forces the plug from its place.

AN ELECTRIC DETECTOR OF ORES.

The most difficult problems encountered by the seeker of metals, both noble and base, cannot be fully solved by geological rules. In order to determine the location of blind ledges, and the direction of their dip; the direction of ledges which crop on level ground; the position of the apices and the direction of dip of the principal pay chutes in blind ledges and in undeveloped ledges; the line followed by the pay streak in placer ground, as well as to ascertain definitely the existence or non-existence of ores in any special area of ground, all the prospector can do is to make a shrewd geological guess.

It is said that more money has been spent in guessing of this kind than is ever returned by actual finds. No wonder that the divining-rod charlatan once flourished in ore-mining regions, and that even to this day many a superstitious miner clings to the divining-rod fallacy.

A method of detecting minerals has been discovered and invented by Fred Harvey Brown, of Garvanza, Cal., which, based upon sound electrical laws, seems to place in the hands of the gold prospector a ready means of locating ores with rapidity. Mr. Anthony Blum, of 35 Court Street, Boston, Mass., who is interested in the patent, has tested the apparatus used, in Ontario, and, it is claimed, with success. The Brown method consists in utilizing the various resistances offered by metals in the transmission of electrical currents.

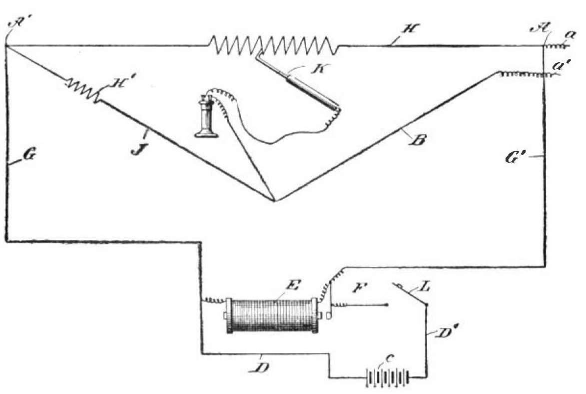
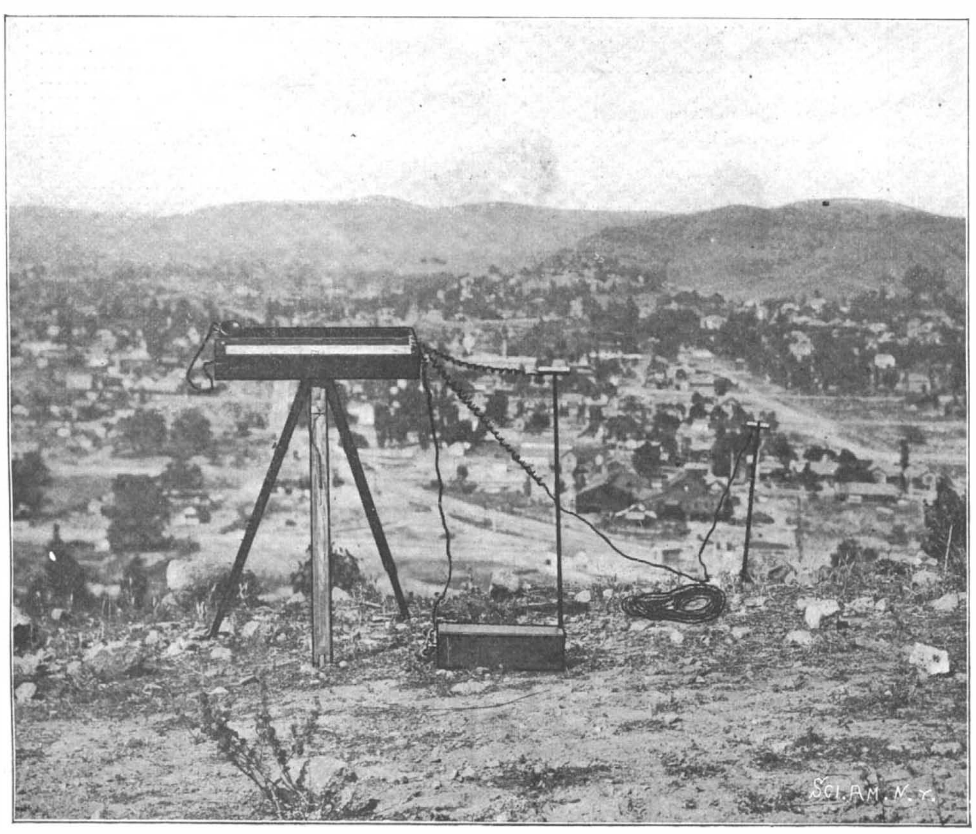


DIAGRAM OF MINERAL DETECTOR CIRCUITS.

Gold, silver and copper are the three best conductors of electricity which are known to us. It follows that earth in which these metals are contained is a better conductor than earth without them. In order, therefore, to detect their presence, it is necessary to measure the resistance of the earth as a conductor. The amount of resistance is ascertained by inserting two rods in the ground at a definite known distance apart. The resistance between the two rods is measured. If this resistance be high, the ground between the rods is barren of metal; if low, a good conductor is buried in the ground. Several measurements of the same nature are taken in order to cover a fairly large area. The resistances are plotted on a map of the ground, a study of which reveals the location of all the metal contained in the ground traversed. After having located an ore the next step is to ascertain approximately its depth. The long-established principle that a current follows the path of least resistance is applied, in order to ascertain the depth. To determine the depth of an ore already located, the rods are placed a long distance apart, the measurements over the ore body being successively shortened until they no longer give any indication of the presence of metal. To be sure, this method does not indicate the character of the ore; but that can be easily enough determined by the nature of the region itself.



THE MINERAL DETECTOR SET UP.

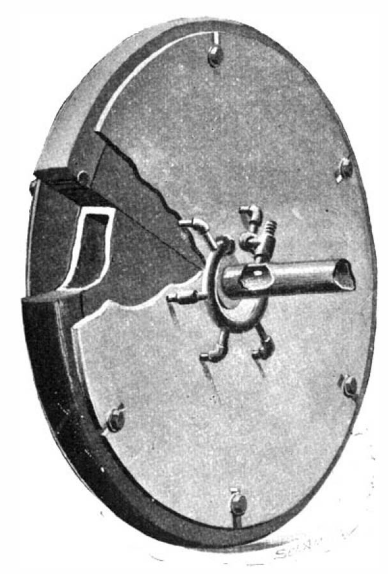
The accompanying diagram shows the various parts of the apparatus used, as well as the circuits. The apparatus is set up at any convenient point. An electrode or conducting rod of brass is driven into the earth, which rod is connected by a wire, *a*, with the binding post, *A*, of a Wheatstone bridge, *E*, which forms part of the apparatus. A similar conducting rod is connected with the other binding post, *A'*, of the Wheatstone bridge. A battery, *C*, is connected by, and in series with, wires, *D D'*, and with an electromagnet, *E*. An interrupter, *F*, is arranged to break the circuit, *D'*. Wires, *G G'*, run to the diamond points of the bridge at *A A'*. Between the points, *A A'*, a high resistance wire extends which is calibrated from *A* to *A'*. In one arm, *J*, of the bridge a resistance, *H'*, is inserted. A telephone receiver forms with a stylus, *K*, a part of the bridge circuit. The end of the stylus is arranged to contact with the high resistance-wire, *H*. When the contacts have been made with the brass rods previously mentioned, the operator closes the circuit by moving a switch, *L*. The battery, *C*, then sends a current through the electromagnet, *H*, and through the wires, *D D'*, thus magnetizing the core of the magnet and setting the interrupter in operation. In this manner the current in the circuit, *D D'*, is made and broken. The interrupter causes what is termed a "direct-extra current" to be thrown off from the convolutions of the electromagnet, *E*, when the circuits, *D D'*, are open. This direct-extra current consists of impulses which are continuous in direction and are successively thrown off in harmony with vibrations of the interrupter. The impulses pass through the only circuit which is then closed, or in other words, through *G G'*, wire *a*, into the earth and out of the earth at the corresponding brass rod, and through the wire *a'* to the bridge at *A'*, through the arms, *H*, *J* and *B*. The operator then, with the telephone receiver at his ear moves the point of the stylus, *K*, along the calibrated wire, *H*, until a point of silence is reached. By this method a tone is produced in the receiver which is clear and pronounced to the point of silence. The absolute point of silence occurs at the point of balance of the bridge.

With this method of ascertaining the presence or absence of ores in mining regions it is evident that much of the time and labor which were formerly spent in prospecting is reduced to a minimum. Prospecting no longer becomes a matter of guesswork, but of scientific certainty.

Various schemes have been suggested from time to time for the practical utilization of the power exerted by the brisk lake breezes for which Chicago is famous among other things. The latest in this line is the invention of Charles Wondries, of that city, who recently gave a public demonstration of a device invented by him. He makes use of the draught of a high chimney, and for the purpose of exhibiting his machine placed it in an abandoned stack at Riverside, a part of Chicago. Despite the fact that the chimney was declared unsafe, quite a number of persons ventured inside to witness the operation of his machine. A strong west wind was driving at the time, and it blew into the opening of a canvas chute at the base of the chimney. It was carried up with increasing velocity until it reached the top, where it was directed against the blades of two wheel fans, which in turn drove a large flywheel. The power produced is said to depend on the height of the chimney. Wondries says he has been driving a sewing machine at his home for six months by this means, using a very small stack.

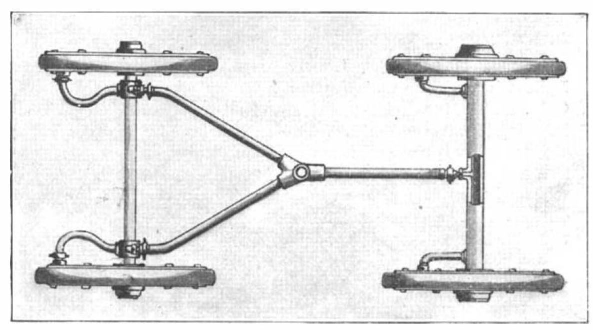
PUNCTURE-PROOF INFLATABLE WHEEL.

An inflatable wheel of an entirely new design is herewith illustrated. The wheel is practically puncture-proof, and will be found especially serviceable for automobile and other vehicles. The structure affords a resilient support to the superimposed load, and owing to the substantial construction is especially adapted for long-distance runs over ordinary roads.



A PUNCTURE-PROOF INFLATABLE WHEEL.

One of our illustrations shows the simple construction of the wheel. Held tightly between two plates which form the side faces of the wheel are a series of pouches or cells made of rubber or other elastic material and capable of expanding under the pressure exerted by an inflating medium, such as air or gas. An elastic cushion tire surrounds these pouches, and is held in place by bolts which pass through the same and clamp it tightly between the side plates of the wheel. It will be observed that this tire, which is compressible, has direct engagement with the elastic pouches that are adapted to afford a cushion to the tire; and as the tire is adapted to give under the weight of the load, and when striking obstacles in its path, it is found necessary to employ yieldable connections between the tire and the side plates. This is provided by arranging the stay-bolts to enter slots radially disposed along the rims of the side plates. From this description it will be seen that the pouches provide a series of independent chambers or cells within a wheel of cellular structure, and it becomes important to provide a means for simultaneously and uniformly inflating these sections. This is attained by providing an annular distributing pipe arranged to loosely surround the hub portion of the wheel and having connection with each of these pouches. A force pump may then be applied to this pipe, and the wheel will be uniformly inflated. Owing to the shielded positions of the pneumatic pouches, the possibility of a puncture in one of these wheels is remote.



THE WHEELS CONNECTED FOR UNIFORM INFLATION.

The wheel is illustrated as secured to a hollow axle, the latter serving as a reservoir for highly compressed air, so that in case of leakage from the pouches they may be reinflated by opening a valve which connects this chamber with the distributing-pipe. One of our engravings shows a running-gear provided with these wheels and hollow axles. The illustration indicates the method of connecting the upper parts so that all the wheels may be pumped up simultaneously by applying the pump to a connection at the center of the machine. A patent on this improved wheel has recently been granted to Mr. Alexander Honrath, 5 West End Avenue, New York city.

Dr. Adolph Cohut recently published an article in the Berliner Tageblatt disputing the assertion that the late Emanuel Hermann, of Vienna, was the inventor of the postcard. He says the credit is due to Heinrich von Stephan, who was Postmaster of Germany. He made an eloquent plea for the postal card at the Fifth Postal Congress at Karlsruhe in 1865, but the card was not adopted at that time. This, however, was the first agitation of the subject.

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

BEET-TOPPER.—M. W. PALMER, Hamilton, Mich. Mr. Palmer is the inventor of certain new improvements in beet-toppers. The feature of novelty consists in a main frame having a carrier frame movable vertically therein and capable of being operated by means of levers. The cutter-knives are supported by this movable carrier and are arranged to yield when passing obstructions. A gage device operates to automatically limit the descent of the cutters.

HAY RAKE AND LOADER.—E. D. DONEY, Ovando, Mont. The purpose of this invention is to provide a rake with a side-loading attachment, which attachment receives the hay from a conveyer carried by the body of the machine, the conveyor having the hay delivered thereto by a series of rake teeth. Means are provided for elevating the rake head so that large articles may be readily passed.

TOBACCO-TRUCK.—W. G. LITTLE, Farmville, N. C. By this invention Mr. Little aims to provide a truck which will be narrow, so it can be operated between the tobacco rows; will be light, so that it can be readily drawn from place to place; will have sufficient strength, will not be likely to turn over, in which all the wheels will be arranged within the lines of the opposite sides of the bed of the truck, and in which the front of the truck will be supported by a pair of wheels mounted in the wheel-frame connected to turn and affording a support at the front of the truck of sufficient width to reduce to a minimum the danger of the truck overturning.

Apparatus for Special Purposes.

GAS-GENERATOR.—C. J. LUTHER, Red Bank, N. J. The invention consists principally in the combination of devices for carbonizing bituminous coal, the decomposition of steam, and the generation of carbureted hydrogen, the coal-gas passing off from one channel, the water gas and heavy carbureted gas being successively mixed, fixed, and passed through a separate channel, where it comes in contact with the coal-gas and mixes therewith, the mixed gases being then carried to a separate vessel for use for illuminating or fuel purposes.

CONCENTRATOR.—J. A. HOLMES, Salt Lake City, Utah, and JOHN F. WOOD, Denver, Colo. This invention relates to improvements in concentrators and amalgamators and the object is to provide a machine of this character having novel features of construction whereby all the gold or other values may be quickly separated from the ore or pulp placed therein.

Mechanical Devices.

POWER-HAMMER. — C. H. KREHBIEL, Moundridge, Kans. The object of this invention is to provide an improved power-hammer of simple construction which will be very effective in operation and which is arranged to allow of convenient adjustment of the hammer relatively to the anvil at the will of the operator according to the nature of the work under treatment at that time.

ENVELOPE-SEALING MACHINE.—H. E. GAVITT, Topeka, Kans. The invention is an improvement for sealing envelopes. In operation the envelopes are fed into the machine, the flaps moistened, turned, and finally pressed tightly to sealing position. The machine it is claimed will seal from 8,000 to 15,000 envelopes per hour of any ordinary bulk, mixed sizes, and specially adjusted will seal at about the same rate up to one-half inch in thickness.

Miscellaneous Inventions.

BLANK FOR PIPE-ELBOWS.—E. H. SMITH, Mount Vernon, Ohio. Mr. Smith herein provides a novel construction of so-called "intermediate blanks" used in the construction of pipe-elbows. The blank is composed of sheet metal having opposite semi-cylindrical portions and an intermediate elevated portion. The semi-cylindrical portions are provided with transversely-extending crimps and are united by the longitudinal, intermediate elevated portion.

GRATE.—G. T. VAUGHN, Griffin, Ga. Mr. Vaughn has invented a grate of improved construction which has a marked tendency to prevent smoking and will render the combustion of fuel more perfect than with present constructions, thus effecting a great saving in the expense of fuel and avoiding the vexations due to smoky chimneys.

BODY-BRACE.—P. B. SHELDON, Erie, Pa. The invention relates to an apparatus for relieving the spine of the weight of the shoulders and for otherwise assisting in the support of the trunk of a deformed or ill-developed person.

SPLIT COLLAR.—E. H. SEXTON, Sandyhill, N. Y. Mr. Sexton has provided in this invention an improved split collar of simple and durable construction which may be readily applied to and securely locked in place on a shaft or other revolving part.

PROCESS OF TREATING ANIMAL TENDONS.—E. NELSON, Lima, Ohio. This invention provides a process for preparing animal tendons for use as packings. The process consists in subjecting the animal tendons to the action of preservatives and then impregnating the tendons thus treated with lubricants. The packings may be used for pumps, engines and nearly all other machines where packings are required.

DESIGN FOR A SIDE FRAME FOR CHATELAINE BAGS.—L. WOLF, New York, N. Y. The design consists in a marginal bead-like border and a central, plain, bevel-like surface within the border, forming a granular, intermediate ground, sharply defined from the border. The general form of the frame simulates that of a crescent with the concave swelled centrally, producing a double ogee form at the concave side of the frame.

COMBINATION-TOOL FOR MANIPULATING WIRE.—E. C. CULLEN, Colorado, Texas. Mr. Cullen is the inventor of a new wire-forming implement which is adapted more particularly to permit ready bending, straightening, shortening and otherwise manipulating of the wires ordinarily used in the construction of fences.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Inquiry No. 3228.—For a hand machine for fringing or raveling old carpet.

Inquiry No. 3229.—For makers of pocket linen tape measures in spring cases.

Inquiry No. 3230.—For makers of coin vending machines.

Inquiry No. 3231.—For manufacturers of machinery for making furniture springs.

Inquiry No. 3232.—For an electric tattooing machine.

Inquiry No. 3233.—For makers of parabolic reflectors for arc light used in wireless telegraphy.

Inquiry No. 3234.—For makers of flexible tubes, about one inch.

Inquiry No. 3235.—For machinery and accessories for the manufacture of pins and cross arms for telephone lines.

Inquiry No. 3236.—For makers of pearl button machinery.

Inquiry No. 3237.—For a generator that generates gas from kerosene oil, for use in range or furnace.

Inquiry No. 3238.—For parties to make a linoleum knife.

Inquiry No. 3239.—For makers of straight-line horizontal engines for automobiles.

Inquiry No. 3240.—For information regarding a slot machine for smelting and stamping a miniature horseshoe from sheet steel.

Inquiry No. 3241.—for tempered wire from 3-32 to 3-16 in size.

Inquiry No. 3242.—For machinery for making butchers' skewers.

Inquiry No. 3243.—For a machine for tinning sheet metal on one side only.

Inquiry No. 3244.—For a dip for sheet copper that will make a smooth, bright surface and will not tarnish readily.

Inquiry No. 3245.—For a 2 h. p. water motor for running printing presses.

Inquiry No. 3246.—For the manufacturers of "Ozonine" for bleaching cloths.

Inquiry No. 3247.—For a self-registering dial thermometer.

Inquiry No. 3248.—For makers of composition carvings.

Inquiry No. 3249.—For the manufacturers of the Star blue flame oil burner for ranges and heaters.

Inquiry No. 3250.—For makers of apparatus for the generation and compression of chlorine gas.

Inquiry No. 3251.—For the makers of the Baker Common Sense oil filters.

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AND EACH BEARING THAT DATE.

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Electric motors, controlling, H. W. Leonard 709,916
Electric switch, B. J. Foley 710,188
Electric switch, F. H. Headley 710,270
Electric time switch, automatic, H. K. Gardner 710,146
Electrical distribution system, A. D. Lunt 710,067
Electrical distribution system, Steinmetz & Emmet 710,081, 710,082
Electrical distribution system, B. G. Lamme 710,158
Elevator, C. E. Ennes 709,974
Elevator, J. Rice 710,007
Emery grinder, N. Cornfield 710,098
Engine, W. A. Bole 710,136
Engine igniter, explosive, H. E. Barlow 710,312
Engine lubricator, explosive, C. W. Weiss 710,026
Engine safety appliance, Karlik & Witte. 710,155
Engine tender, traction, F. J. Wood 710,028
Engraving machine, C. B. Bishop 709,863
Envelop, A. J. Arendell 709,952
Envelop, mailing, W. T. Lee 710,200
Explosive engine for motor vehicles, R. C. Marks 710,329
Extension table, C. N. Smith 710,376
Eyeglass guard, A. S. Weaver 710,227
Eyeglasses, W. W. Essick 709,892
Fan, W. McNamara 710,295
Fan, dissectible, J. L. Perkins 710,298
Feeder, automatic boiler, C. Cummings 710,317
Fence post and fence stay, V. H. Abbott 710,031
Fertilizer distributer and seed planter, combined, W. B. Rohmer 710,011
File, H. F. Engleking 709,889
File, letter, W. F. Maloney 710,364
Filter, T. Linke 710,285
Fire, apparatus for discharging inflammable or other liquids from storage tanks at the outbreak of, C. Allenou 710,091
Fire extinguishing and life saving apparatus, W. A. Nickerson 710,069
Fire hose, telegraph, J. Buchtel 710,246
Fire lighter, H. Braby 710,315
Fireplace, G. Vitti 710,226
Fireproof floor construction, M. Watson 710,308
Fireproof frame building, G. E. Voelkel 710,307
Flashing apparatus, revolving group, A. Brebner 710,244
Flashing lighthouse lights, etc., eclipsing screen for revolving group, A. Brebner 710,243
Flask: See Molding flask.
Flask support, tilting, C. Phelps 709,925
Floor clamp or jack, A. Tretsven 710,169
Flue scraper, Swinscoe & McCarty 710,344
Fluid meter, W. H. Reynolds 710,212
Fluid operated signal, Bell & Halstead 710,397
Folding box, F. Cunning 709,965
Food products, curing, C. B. Trescott 710,125
Forging press, hydraulic, H. V. Loss 710,286
Fountain comb, J. R. Harrison 710,269
Fuel, apparatus for the combustion of finely divided solid, J. W. Bailey 710,033
Fume arrester, A. W. Gilliland 709,896
Furnace blast regulator, Cabot & Vaughen 710,247
Furnace for separating zinc from ores, A. M. G. Sebillot 710,217
Fuse igniting tape, J. H. Garson 709,979
Garbage furnace, R. L. Walker 709,946
Garbage receptacle, F. E. Holzhauer 709,983
Garment fastener or supporter, J. Jenkins. 709,909
Garment holder, N. Douglas 709,970
Garment supporter, C. A. Deardorff 709,879
Garment supporter, A. A. Mudd 710,292
Gas engine, G. Westinghouse, ... 710,385
Gas generator, acetylene, G. C. Smith, reissue 12,041
Gas generator, acetylene, J. Ledru 710,159
Gas heater, J. W. Carter 710,248
Gas manufacturing apparatus, H. M. Papst. 710,336
Gases to high-tension discharges, apparatus for subjecting, Bradley & Lovejoy 709,868
Gate, J. Clinton 710,250
Gate, I. L. Landis, reissue 12,039
Glass, manufacture of window and plate, W. E. Heal 710,357
Glass panes, strip for securing, J. Swannell 710,025
Glass plate making machine, L. Appert 710,032
Grading and excavating machine, W. H. Morenus 709,921
Grass cutting machine, J. Swanson 710,222
Grate bar, gas burning, J. A. Abrams 709,951
Gun, automatic rapid fire, V. P. De Knight 709,880, 709,881, 709,883
Gun firing mechanism, V. C. Tasker 710,124
Gun, magazine, J. M. Browning 710,094
Gun, rapid fire, V. P. De Knight 709,882
Hair crimper, J. A. Klarson 709,989
Hame and trace connector, G. B. Withers. 709,950
Hammer, power, T. Holmstrom 710,358
Hanger, H. T. Hallowell 710,191
Harvester, beet, J. J. Rookus 710,075
Hat pin, J. Wiesen 710,349
Hatch fastener, Rankin & Dierix 709,928
Hay press door closer, P. H. McVicar 710,166
Heater, W. L. Warner 709,947
Heating or cooling pipe, R. Commichau 709,875
Heel and edge trimming machine guard, Stratton & Cole 710,343
Hinge, gate, P. Fullam 710,051
Hobby horse, J. Seng 710,218
Hoe, asphalt, S. Harper 709,903
Hog belly rolling machine, McClean & Phipps 709,997
Hoisting and transporting device, W. H. Hatfield 709,905
Hook and eye, J. R. Hard 709,902
Horse training apparatus, A. Graf 710,267
Hot air apparatus for the human body, G. W. Sawyer 709,931
Hub, J. W. Blodgett 710,241
Hub, wheel, E. Nolan 710,002
Hydrocarbon heater, A. A. Low 710,108
Hydrocarbon motor feed-controlling mechanism, Tuck & Wassmann 710,087
Hydrostatic press, W. D. Butt 710,039
Ice creeper, adjustable, J. H. Downer 710,187
Indicator: See station indicator.
Indicator, T. F. McCullough 710,294
Ink well, J. D. Dickson 710,259
Insulating hanger, J. M. Schmidt 710,216
Insulator, E. Lefever 710,282
Insulator, R. S. Peirce 710,297
Internal combustion engine, J. A. Prestwich 710,302
Jar or bottle closure, F. Tyson 710,347
Keyboard perforator, D. Murray 710,163
Keyed instruments, automatic player for, M. Clark 709,962
Kinetoscope, T. A. Edison, reissue 12,037
Kinetoscopic film, T. A. Edison, reissue 12,038
Kraut cutter, Kinkade & Mager 710,326
Lacing hook, E. L. Puke 710,210
Lamp, T. J. Litle, Jr. 710,064
Lamp, acetylene gas, A. K. Miller.710,023, 710,204
Lamp circuits, maintaining uniform resistance in arc, F. A. Gilbert 710,068
Lamp, electric arc, C. E. Harthan 710,055
Lamp, electric arc, A. F. Shore 710,374
Lamp glower and attaching terminal wires thereto, electric, E. R. Roberts 710,369
Lamp glowers, circuit breaker for electric, F. M. Goddard 710,356
Lamps, exhausting incandescent electric, S. E. Doane 710,186
Lamps of relatively low voltage, exhausting incandescent electric, S. E. Doane 710,099
Lapping machine, W. I. Lewis 710,107
Lawn trimming implement, C. Fernstrom 709,976
Lead, apparatus for producing white, J. W. Bailey 709,954, 709,956
Lead carbonate, producing, J. W. Bailey. 709,955
Lead, producing white, J. W. Bailey 709,957
Leather working machines, operating roll for, A. F. Jones 710,102
Lens grinding machine, J. F. Byington 710,180
Level and plumb, spirit, S. Winberg 710,388
Level, plumb and inclinometer, G. W. Lingle 709,990
Life preserver, C. Hunt 710,275

Liquid dispensing apparatus, S. W. Moran. 710,291
Lithographing or printing press roller, A. W. King 710,327
Lock, Paige & Hoods 710,071
Loom, filling replenishing, E. S. Stimpson 710,023
Loom let-off arresting mechanism, E. S. Stimpson 710,024
Loom loose reed motion, E. Herzig 710,192
Loom weft replenishing mechanism, Talbot & Rossetter 710,379
Looms by the quantity of weft in the shuttles, mechanism for controlling, J. H. Klerx 709,910, 709,911
Lubricating pump operating apparatus, B. Ivor 709,986
Lubricator and liquid dispenser, C. F. Clements 710,184
Machinist's V-block, Cobb & Spaulding 709,873
Magnetic and non-magnetic materials from one another, apparatus for separating, J. W. R. T. Heberle 709,982
Mattes, treating, Potter & Harvie 710,300
Mattress, hospital, D. T. Rosett 710,076
Measuring and emptying device for bottles, B. Arthurs 709,858
Medicine capsule, D. S. Kann 710,060
Merry-go-round, land, marine or submarine, A. Davidson 710,043
Metal plate lifting device, E. B. Clark, 2nd 710,041
Metal shearing machine frame, B. Wesselmann 710,310
Metering apparatus, multirate, E. Oxley 710,070
Milker, cow, F. A. West 710,384
Mirror hanging, J. G. Allen 710,235
Molding flask, J. Mills 710,331
Mooring block or clump, G. C. L. Lenox. 709,914
Motor, C. J. 'Cullen 709,877
Movement controlling mechanism, variable, H. D. Meier 710,202
Mower, A. Mayer 710,289
Mower, lawn, F. L. Adams 710,131
Mowing machine, White & Jones 710,228
Musical instrument transposing device, M. Clark 709,963
Negative plates for bichromated gelatin processes, producing, A. Leuchter 710,106
Nipple, E. E. Menges 710,114
Nitrogen compounds from atmospheric nitrogen, manufacturing, Bradley & Lovejoy 709,867
Numbering machine, J. J. Chattaway 710,140
Numbering machine, F. M. Turck 710,380
Nut, vehicle axle lock, Belfield, Shearer, Findlay & G. Belfield 710,240
Nut wrench, adjustable, J. T. Viles 710,382
Oil burner, S. M. Trapp 709,941
Oil distributing apparatus for calming waves, N. Salvesen 710,013
Organic peroxids, making, R. H. Page 710,005
Oven or furnace, J. W. Lewellen 710,284
Package carrier, E. J. Stewart 709,936
Packing, rod, A. B. Pratt 710,337
Pail filling and indicating device, J. H. Wilson 710,230
Pail hook, C. W. Mitchell 709,919
Paper, etc., machinery for cutting and folding, R. C. Seymour 710,080
Paper roll holder, W. H. Belknap 710,034
Paper tube making machine, J. H. and E. L. White 710,386
Parer, apple, M. B. Brooks 710,351
Parer feeding apparatus, fruit, L. I. Yeomans 710,390
Pen or pencil holder, J. S. McClung 710,293
Pencil and sharpener therefor, R. Y. Cormack 710,255
Phonograph resonator or amplifier, W. S. How 709,984
Photochromoscopic apparatus, T. K. Barnard 710,237
Photographic emulsion, Y. Schwartz 710,019
Photography, apparatus for animated, H. M. Reichenbach 710,339
Piano player valve, J. H. Chase 710,097
Pipe coupling, L. S. Osgood 710,004
Pipe wrench, C. C. Rueger 710,077
Pitch board, adjustable, A. Jones 710,058
Placket fastener, T. M. Stearn 710,123
Planter, corn, H. Rentsch 710,303
Planter, cotton, W. Furlong 709,895
Planter disk cutter attachment, corn, H. Rentsch 710,211
Plastic articles, production of, E. Lottier 710,287
Plow, E. Hankins 709,901
Pneumatic cushion, J. H. Finney 709,977
Pneumatic tool, J. Keller 710,196
Pole, jointed, M. Nelson 709,924
Policeman's club holder, F. H. Audley 710,236
Power shovel, R. Thew 710,223
Printing color for lithographic or metallographic printing, Adelsberger & Friedmann 710,233
Printing machine, roller, T. J. Smith 709,933
Printing machine, stencil, A. B. Dick 709,885
Propeller, C. A. Manker 710,111
Pulp vessels, apparatus for the manufacture of closed, F. B. Howard 710,101
Pump, C. C. Worthington 710,030
Pump, air, C. M. Day 709,968
Punching bag support, G. S. Maxwell 710,113
Punching bag supporting device, G. S. Maxwell 710,112
Puzzle, W. H. Emery 709,888
Pyrotechnic compound, A. Eichengrun 710,047
Rail bonds, manufacture of, Daniels & Wyman 709,878
Rail fastener, metallic tie, C. S. Shallenberger 710,371
Rail joint, J. J. McDermott 710,000
Rail joint, Minck & Droste 710,290
Rail support, W. E. Jaques 710,152 to 710,154
Railway danger signal, W. Washa 710,383
Railway sand distributer, W. H. Bell 710,134
Railway signaling, electrical system of recording and checking as applied to, W. H. M. Weaver 710,348
Railway switch operating device, J. C. Booth 709,865
Railway system, electric, W. B. Potter 710,072
Railway tie, metallic, H. W. Avery 710,172
Railway track structure, E. B. Entwistle 709,975
Rat trap, B. F. Short 710,020
Ratchet wrench, J. E. Dickie 710,185
Refrigerator, H. Aylmer 710,173
Regenerator burner, C. W. Weiss 710,130
Resistance coil and support therefor, H. P. Davis 710,143
Revolver ejector mechanism, J. D. Robertson 710,008
Riveter, Pneumatic, J. Keller 710,197
Road roller, L. B. McAlpine 710,165
Rocking chair, adjustable, C. A. Bergstrom 710,035
Roller: See road roller.
Rolling metal tubes or other hollow or solid bodies, A. E. Beck 709,958
Rolling mill, V. E. Edwards 709,972
Rolling sheet metal cylinders, machine for, M. M. Parker 710,117
Rotary engine, W. Jamieson 709,908
Rotary engine, T. J. Bush 709,961
Rotary engine W. F. Evans 710,261
Rowing appliance, W. B. Goodwin 710,147
Rubber dam holder, G. W. Todd 710,306
Saddle, J. R. and C. B. Hastings 709,904
Saddle pad, pneumatic, H. R. Rensman 709,930
Safety elevator, P. H. Burgart 710,038
Safety pin, W. F. Baldwin 709,860
Sash lock, D. Forbes 710,189
Saw, W. G. Anderson 709,857
Saw log carriage offset, S. Erb 709,890
Sawmill knee indicator, J. D. Beatty 710,238
Scale platform support, F. C. Osborn 710,003
Screens, blinds, etc., brace for, M. H. Stevens 710,022
Seed drill furrow opening and covering attachment, L. C. Sweet 710,378
Seeding machine, R. L. Rhea 710,119
Seeding machine, F. G. Colley 710,251
Seeding machine, Heath & Baseman 710,272
Sewer trap, J. Pratt 710,209
Sewing machine, J. T. Hogan 710,150
Sewing machine bobbin holder case, A. Doring 709,886
Sewing machine buttonhole, J. T. Hogan 710,149
Sewing machine table or cabinet head, Cuber & Hackenbroch 710,042
Shade bracket, adjustable, W. H. Sattelberg 710,215
Shade roller bracket, Clowse & Stevens 709,964
Shades, means for sustaining and adjusting window, A. Serafinski 710,079
Shafts, electromagnetic device for controlling the rotation of, P. V. Avril 710,311
Sheet metal pipe, F. L. Filson 710,262
Shingling carriage and gage, F. C. Leek 710,281
Shipping box, J. T. Hicks 710,100
Show case or show front, J. L. Crane 710,141
Show window construction, H. Hunter 709,985
Signaling apparatus, H. A. Fessenden 710,320
Skein holder, L. M. Tressel 710,126
Skirt holder, C. W. Baughman 709,862
Slack adjuster, Keville & Carey 710,361
Slicer and cutter, potato, L. L. Stevens 710,085
Sound records in celluloid, producing, A. N. Petit 710,299
Spectacle frame, F. Schick 710,015
Spectacles, M. H. Cohen 709,874
Spectacles or eyeglasses, W. S. Essick 709,891
Speed changing device, C. C. Tyler 710,225
Speed mechanism, Heath & Baseman 710,271
Spool stand, E. Buffum 710,095
Spring cushion, E. Denegre 709,969
Spring cushion, A. C. McCord 709,998, 709,999
Spring structure support, W. G. Engle 710,260
Sprinkler head, P. Huebner 709,907
Stairway, moving, J. M. Dodge, reissue 12,036
Stalk chopper, W. L. Adamson 710,232
Stamps, operating device for dating or other, H. De Wallace 710,144
Station indicator, A. Kuentz 709,912
Steam generator, E. de Porto-Riche 709,926
Steam generator, R. J. Barton 710,313
Stering gear, electrical, M. W. Day 710,045
Still, ammonia, G. Stroh 710,221
Stitch ripper, F. L. Marshall 709,917
Stoker, mechanical, Arthur & Binnie 710,171
Stove, H. Hoefli 710,193
Stove, gas, M. Griswold, Jr. 710,053
Stove, gas heating, G. R. Moon 710,162
Stove, summer cook, C. E. Cooke 709,876
Stovepipe thimble, A. Staub 710,168
Submarine transportation system, A. Davidson 710,044
Suspender end loop, H. E. Barnett 710,092
Suspension hook, Kerr & Lauster 710,061
Switch: See Electric switch.
Tapping and stud-setting device, Osteman & Blood 710,116
Telegraph or telephone lines, selective call for, W. Palmer, Jr. 710,335
Telegraph system, wireless, H. Shoemaker. 710,121, 710,122
Telegraph system, wireless, C. D. Ehret. 710,354, 710,335
Telephone exchange toll apparatus, W. W. Dean 710,318
Telephone lines, selective calling appliance for, F. R. McBerty 710,333
Telephone, self-restoring, L. J. Loeffler 710,065
Telephone switchboard signal lamp, McBerty & Loveridge 709,996
Telephone transmitter, M. Weisser 710,309
Telescope, binocular prism, C. P. Goerz 709,898
Temperature of heating systems, means for regulating, W. P. Powers 710,301
Thill coupling, J. M. Bryant 710,316
Thill coupling, A. Mendenhall 710,365
Thresher, pea, Paris, Steelman & Haverfield 710,366
Till, Clark & Jones 709,870
Tire setting machine, rubber, J. C. Blake. 710,135
Tire tubes, tip for the ends of pneumatic, J. G. Moomy 709,994
Tire, vehicle, F. P. Brining 709,959
Tire, wheel, E. Horton 710,274
Tobacco leaf stringing machine, S. D. Wheeler 710,027
Tobacco ordering chamber, J. M. Taliaferro 709,938
Toe, box, H. H. Beckwith 710,239
Tool holder, J. F. Bachmann 709,953
Tool holder, A. H. and J. A. Bedworth 710,174
Torpedo, railway, E. S. Lafferty 710,362
Torpedo shell protector, J. M. Hatfield 710,323
Toy, D. J. Wilson 710,090
Toy air gun, P. D. Horton 710,359
Toy, walking, E. A. Jeffreys 709,987
Train order holder, L. C. Gibbs 710,265
Trap, J. A. Clukies 709,871
Truck, stove, J. H. Smith 710,394
Tube machine, F. Deming 710,046
Turbine gate balancing device, W. W. Tyler 710,381
Type distributing apparatus, A. A. Low. 710,066
Type line detaching mechanism, Johnson & Low 710,057
Typewriter carriage mechanism, C. Sears 710,393
Typewriter, electrical, C. Gibbs 710,264
Typewriting machine, M. S. Eylar 709,893
Typewriting machine, C. F. Hopkins 709,906
Typewriting machine, G. H. Williams 710,089
Umbrella rib and stretcher joint, C. MacMillan 710,328
Universal coupling, A. G. Mather 709,992
Unloading apparatus, F. H. Treat 710,224
Vaccine container, H. M. Alexander 710,234
Valise, telescoping, C. A. Bodwell, Jr. 710,037
Valve, E. G. Watrous 710,129
Valve gear, P. H. White 709,949
Valve lever spool, P. Thomas 709,940
Valve, street sprinkler, M. G. Bunnell 709,960
Vegetable albumen, extracting, F. W. Gaertner 710,190
Vehicle, motor, W. C. Baker 709,859
Vehicle, motor, F. C. Goddard 709,897
Vehicle, road, P. Christiansson 710,249
Veneer bending machine, E. Aber 710,231
Veneers, apparatus for edge uniting, W. M. Boenning 709,864
Ventilator, J. R. Wild 710,350
Vise, pipe, Vogelbach & Gray 709,944
Wagon brake, Swisher & Burger 710,345
Wagon, dumping, E. M. Sandy 710,214
Wardrobe, L. Robertson 710,009
Washstands, means for attaching bowls to the slabs of, J. A. Chukies 709,872
Water closet, D. S. Schureman 710,342
Water closet seat, detachable, H. M. Solveson 710,021
Water closet valve, E. G. Watrous 710,128
Water cooling apparatus, W. J. Dossey 709,887
Water tube boiler, E. G. Rust 710,340
Water wheel, R. E. Woolman 710,029
Wheel: See Water wheel.
Wheel, M. S. Shotwell 710,375
Wind turbine, J. Kaiser 710,277
Window seat, L. Wagener 710,127
Window, sliding, W. E. Hardeman 710,322
Wire reel truck, F. W. Schooley 709,932
Wire straightener, J. G. Iverson 710,151
Wrapper, package, L. S. Miller 710,332
Wrench, T. H. Cahill 710,040
Wrench, M. M. Murray 710,164
Wrench, J. T. Burr 710,179
X-rays, means for preventing injury in using, L. T. Lowder 710,201

DESIGNS.

Bicycle rack, M. G. Merritt 36,091
Clock case, L. V. Aronson 36,084
Coin-controlled mechanism, case for, M. Benedict 36,087
Finger ring, M. L. Powers 36,083
Jardiniere stand, F. W. Olsen 36,086
Lamp body, A. L. Baron 36,085
Shade cloth, J. H. Wright 36,093
Stove, C. Puddefoot 36,090
Tile, A. Plant 36,089
Umbrella cover, E. L. Smith 36,092

TRADE MARKS.

Barley grits, Schumacher Cereal Co. 38,963
Beer and malt extract, Birk Bros. Brewing Co. 38,968
Beverages, certain named carbonated, Static Carbonating Company 38,969
Billiard cloth, B. A. Stevens 38,943
Cap visors, E. Mattes & Son 38,945
Carbonating apparatus and appliances, Static Carbonating Company 38,970
Coffees, Southern Coffee Company 38,966
Cotton threads, New England Cotton Yarn Company 33,944
Covering and protective materials, certain named, Standard Paint Company 38,947
Cycles, motor vehicles and their parts, Fabrique de Moteurs & de Machines (ancienne maison Zurcher, Luthi & Cie.) 38,973
Dyestuffs, coal tar, Actien-Gesellschaft fur Anilin-Fabrikation 38,951
Films, plates and photographic papers, Actien-Gesellschaft fur Anilin-Fabrikation 38,950
Fire extinguishers, chemical, Tea Tray Company of Newark, N. J. 38,972
Flour, N. Story & Co. 38,960, 38,961
Flour, wheat, H. H. King & Co. 38,962
Food choppers, cylindrical, Landers, Frary & Clark 38,971
Fruits, dried, Aspegren & Co. 38,959
Hair remedy, A. P. Simar 38,954
Medicinal substances, certain named, J. W. Gedney 38,958
Milk and milk products, Bernese Alps Milk Co. 38,965
Oils, illuminating, Philadelphia Chemical Co. 38,952
Packings, plastic metallic, Hileman-James Co. 38,948, 38,949
Polishing, cleaning and preserving certain named surfaces, manufactured powder for, Silver Salt Company 38,953
Remedy for la grippe, catarrh, colds and headaches, F. W. Diemer 38,955
Remedy for the blood, A. B. Scutt 38,956
Sheetings, Belton Mills 38,942
Sugar, refined, Federal Refining Company 38,964
Swimming sleeves, safety, F. B. Wesson 38,946
Tonic, chill and fever, T. S. Roberts 38,957
Vinegar, spirit, C. E. Meyer & Co. 38,967

LABELS.

"Airinit," for footwear, F. W. Slater 9,451
"Baume de Princesse," for facial massage preparation, Alleshouse Pharmacal Co. 9,452
"C. Bohley's Cough Medicine," for cough medicine, C. Bohley 9,453
"Capitol Maryland Rye," for whisky, J. A. Bokel 9,460
"Cheekawgo," for cigars, American Litho graphic Company 9,465
"Corn Husker," for Cigars, Schmidt & Co. 9,471
"Diver Brand Sponges," for sponges, A. Isaacs & Co. 9,450
"Don Carlito," for cigars, Hoffheimer Cigar Co. 9,470
"Dr. Bazemore's Syrup Castor Oil," for Castor oil, W. J. Bazemore & Son 9,456
"Elfin Brand," for sugar corn, S. S. Pierce Co. 9,473
"Golden Pheasant," for tea, Milliken, Tomlinson Co. 9,472
"India Planta," for cigars, American Lithographic Company 9,467
"Jean Bart," for cigars, American Lithographic Company 9,468
"Magnolia," for chewing gum, Lidwell Gum Co. 9,464
"Marvelous Waterproof Shoe Polish," for waterproof oil polish, J. F. Smith 9,457
"Miss Butte," for cigars, American Lithographic Company 9,466
"Mother's Own Ointment," for ointment, Mother's Own Company 9,454
"9-16 Labor Saving," for soldering fluid, A. Levytansky 9,458
"P-A-Y-M-E Concentrated Extract of Vanilla," for extract of vanilla, L. E. Roy 9,462
"Select Combination," for cigars, American Lithographic Company 9,469
"Spring Bank Lithia Cherry Phosphate," for cherry phosphate, Whallen Bros. 9,459
"St. Anthony's Oil," for medicinal oil, Pasadena Medical Company 9,455
"The Pepper Co. Pure Confectionery, Peabody, Mass.," for confectionery, Pepper Company 9,463
"Upper Ten Cocktails," for cocktails, W. R. Lundy & Co. 9,461

PRINTS.

"Clark's Instant Foot Comfort," for foot remedy, Globe Chemical Works 558
"Wright's Health Underwear," for underwear, Seiter & Kappes 557

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

NEW BOOKS, ETC.

A Practical Treatise on Modern Gas and Oil Engines By Frederick Grover, A.M.I.C.E., M.I.E.E. London: John Heywood, Manchester: The Technical Publishing Company, Ltd. 1902. 16mo. Pp. 372. Price $2.

This third edition of Grover's practical treatise is an enlarged textbook on gas and oil engines. As the author informs us in his preface, the enlargements consist of chapters on gas engine efficiency and the application of special diagrams. Experiments on the explosion pressures of acetylene and air are included.

The Practical Catechism. Compiled from the Regular Issues of Power. New York: Hill Publishing Company. 1902. Pp. 210. 8vo. Price $2.

One of the most interesting features of our esteemed contemporary Power consists of the electrical information which has been conveyed from time to time in serial form. The author has collected this information, added much that is new, much that has not been published in the pages of the periodical mentioned, and has succeeded in producing a book remarkable for its practical simplicity. For the presswork, and for the admirably clear illustrations, the publishers deserve praise.

Pipes and Tubes. Their Construction and Jointing. Together with All Necessary Rules, Formulæ and Tables. By Philip R. Björling. London and New York: Whittaker & Co. 1902. 16mo. Pp. 244. Price $1.25.

The author has prepared a practical handbook on the making and use of pipes and tubes of all kinds. Not the least valuable portion of his work is an appendix comprising tables compiled from well-recognized authorities.

Physics. A Textbook for Secondary Schools. By Frederick Slate. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. 16mo. Pp. xxi., 414.

The author tells us in his preface that this elementary course in physics is designed for young people from sixteen to eighteen years of age, who are nearing the close of their training in a secondary school. He has endeavored to present the subject from a standpoint entirely different from that to which we are accustomed. His book is not dogmatic, neither is it a laboratory manual pure and simple. It may be best described as a logical presentation of the subject of physics, in which the student gradually passes from the elementary phases of the subject to those of more complex character.

Colonial Government. An Introduction to the Study of Colonial Institutions. By Paul S. Reinsch. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. 16mo. Pp. x., 386. Price $1.25.

Prof. Reinsch has presented an interesting study of the elements of colonial government. He discusses the modes and methods of colonial expansion from a historical point of view; the general forms of colonial government; and administrative organization and legislative methods. All this information does not apply directly to American problems; for it is the purpose of the book merely to set forth in brief and simple form the colonial policy of the great European powers.

In a Tuscan Garden. By John Lane. London: The Bodley Head. 1902. 16mo. Pp. 419. Price $1.50.

Garden-Craft, Old and New. By John D. Sedding. London: John Lane. The Bodley Head. 1902. 12mo. Pp. 215.

Mr. John Lane more than any other publisher has seen to it that the literature of horticulture shall not decline. Hardly a year passes but a book on gardens issues from his press. The two volumes which lie before us are carefully written little books, which tell what they have to tell in a way that is both interesting and instructive. "In a Tuscan Garden" is not what might be called a practical book; its author is too much of a litterateur for that. And yet it tells much that is of great value to the gardener of England and of America.

The late Mr. John Sedding's "Garden-Craft, Old and New" ought to be more or less known among lovers of gardens. Mr. Sedding knew his gardens, and particularly his old-fashioned English gardens, as few do. Rev. E. F. Russell with a loving care has prepared the manuscript for the press and has succeeded in producing a work which does its author credit and which may well be regarded as a most desirable addition to garden literature.

A Philosophical Essay on Probabilities. By Pierre Simon Laplace. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1902. 16mo. Pp. iv, 196. Price $2.

Laplace's Probabilities is too well known to mathematicians to need any extended review in these columns. It is necessary merely to say that the translators have performed their work with faithfulness.

L'Électricité. Déduite de l'Expérience et Ramenée au Principe des Travaux Virtuels. M. E. Carvallo. Paris: C. Naud. 1902. Price 50 cents.

In his charmingly-written preface Dr. Carvallo tells us that it is his purpose to study fixed or variable electrical states. His method of exposition is to interpret mechanically experimental laws. His principal conclusion is the deduction of two fundamental laws which are the generalization of two laws of Kirchhoff. The author divides his work into two parts. In the first, he explains our present theories of the phenomena of induction; and the second is devoted to electrical manifestations. In both parts the method of exposition is the same. First comes the observation, then an enunciation of experimental laws, and finally an interpretation of these laws in mechanical parlance.

The Hydro-Metallurgy of Copper. By M. Eissler, M.E. New York: D. Van Nostrand Company. London: Crosby Lockwood and Son. 1902. Pp. xii, 228. Price $4.50 net.

Mr. Eissler has gathered in this volume probably all the more important descriptions of the various processes for the hydrometallurgical treatment of copper ores.

The Foundations of Geometry. By David Hilbert, Ph.D. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1902. Pp. vii, 132. 16mo. Price $1.

This book comprises a series of lectures given by Professor Hilbert on Euclidean geometry at the University of Göttingen during the winter semester 1898-1899. Professor Hilbert commences his discussion by considering three systems of things which he calls points, straight lines and planes. He constructs a system of axioms connecting these elements. The purpose of his investigation is to discuss systematically the relation of these axioms to one another and the bearing each has on the logical development of Euclidean geometry.

Architectural Refinements in Italian Churches. By William H. Goodyear, Curator of Fine Arts, Museum of the Brooklyn Institute. Pp. 166-196.

When Mr. Goodyear writes on any architectural subject he is always sure to be read with interest. His contributions to various

architectural papers have been of rare value. In his present paper on Italian Churches he shows a nice artistic appreciation of the work of the early Italian architects and furnishes us with a mass of information that is distinctly new.

Department of the Interior. U. S. Geological Survey. Charles D. Walcott, Director. Reconnaissance in the Cape Nome and Norton Bay Regions, Alaska, in 1900. By Alfred H. Brooks, George B. Richardson, Arthur J. Collier and Walter C. Mendenhall. Washington: Government Printing Office. 1901. Royal 8vo. Pp. 222.

Twenty-First Annual Report of the United States Geological Survey to the Secretary of the Interior, 1899-1900. Charles D. Walcott, Director. In seven parts. Part VII. Texas. Washington: Government Printing Office. 1901. Royal 8vo. Pp. 666. 71 plates. 80 figures.

Commercial Relations of the United States With Foreign Countries During the Year 1901. In two volumes. Vol. I. Issued from the Bureau of Foreign Commerce, Department of State. Washington: Government Printing Office. 1902. Pp. 1191.

Annual Reports of the War Department for the Fiscal Year Ending June, 30, 1901. Report of the Chief of Engineers. Part III. Washington: Government Printing Office. 1901. 8vo. Pp. 1751 to 2596. Index pp. 53.

Annual Report of the War Department for the Fiscal Year Ending June 3, 1901. Report of the Chief of Engineers. Part IV. Washington: Government Printing Office. 1901. 8vo. Pp. 2597 to 3462. Index pp. 53.

United States Geological Survey. Adephagous Clavicorn Coleoptera from the Tertiary Deposits at Florissant, Colorado, with Descriptions of a Few Other Forms and a Systematic List of Non-Ryhn-choporous Tertiary Coleoptera of North America. By Samuel Hubbard Scudder. Washington: Government Printing Office. 1900. Large square quarto. Pp. 145. With 11 plates.

Eighteenth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1896-1897. By J. W. Powell, Director. In two parts. Part II. Washington: The Government Printing Office. 1899. Large 8vo. Pp. 527-648. Plates cviii to clxxxv.

A B C of the Steam Engine. With a Description of the Automatic Governor. By J. P. Lisk, M.E. Six large folding plates of details. New York: Spon & Chamberlain. London: E. & F. N. Spon, Ltd. 1902. Pp. 30.

A Graphic Method for Solving Certain Questions in Arithmetic or Algebra. By George L. Vose. New York: D. Van Nostrand Company. 1902. 32mo. Pp. 62. Price 50 cents.

Nature in New Zealand. Compiled by James Drummond and edited by Captain F. W. Sutton, F.R.S., Christchurch, Wellington and Dunedin: Whitcombe and Tombs, Limited. 16 mo. Pp. 188.

Poultry Architecture. A Practical Guide for Construction of Poultry Houses, Coops and Yards. 100 illustrations. Compiled by George B. Fiske. New York: Orange Judd Company. 1902. 16mo. Pp. vii, 130.

Bishop's A B C Guide. A Hand-Book for Pacific Coast Shippers, Travelers and Business Reference. San Francisco, Cal.: Traffic Publishing Company. 16mo. Pp. 248.

Sur les Principes Fondamentaux de la Théories des Nombres et de la Geométrie. Par H. Laurent. Paris: C. Naud, Publisher. Pp. 68. Price 75 cents.

Section A of the Mechanical Index Comprising Machine Tools. Metal Working Machinery and Accessories, Machinists Small Tools, Etc., including a general index to headings, in English, German and Spanish. New York: The Industrial Press. 1902. Pp. 159.

Bulletin of the Bussey Institution, Jamaica Plain, Boston. Vol. III. Part II. Cambridge: Published by the University. 1902. Pp. 45.

Modern Carpentry. A Practical Manual By Fred. T. Hodgson, architect. Illustrated. Chicago: Frederick J. Drake & Co. 1902. 16mo. Pp. 193.

Around the "Pan" With Uncle Hank. His Trip Through the Pan-American Exposition. By Thomas Fleming. Published by The Nut Shell Pub. Co., New York. 1902. Pp. 262. 8vo.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled

(8703) J. M. L. asks: 1. Will you please give me the two laws of thermodynamics? 1. The first law of thermodynamics is: "Whenever work is performed by the agency of heat, an amount of heat disappears equivalent to the work performed; and whenever mechanical work is spent in generating heat, the heat generated is equivalent to the work thus spent." (De Schanel.) The formula is $W=JH$. W is the work in foot-pounds, if English measures are used; H the degrees which one pound of water would be raised in temperature by the heat; and J, Joule's equivalent, 772 foot-pounds, as determined by Joule, or 773 foot-pounds as redetermined lately by Rowland. The second law is variously stated by different authors. Perhaps the simplest form of the law is: "It is impossible for a self-acting machine, unaided by any external agency, to convert heat from one body to another of a higher temperature." (Clausius.) Another form is: "The efficiency of a completely reversible engine is independent of the nature of the working substance, and depends only on the temperature at which the engine takes in and gives out heat; and the efficiency of such an engine is the limit of possible efficiency for any engine." (De Schanel.) 2. If the specific heat of gold is 0.03244, what weight of it at 470 degs. C. will raise 1 kilogramme of water from 12.3 degs. to 15.7 degs, C.? A. The water is to be raised 3.4 deg. C. 1,000 grammes require 1,000 calories per degree of rise of temperature, and for 3.4 deg. rise require 3,400 calories. The gold is to lose 470 deg. —15.7 deg., or 454.3 deg. One gramme of gold gives out 0.03244 calorie for each degree of loss of temperature, and for 454.3 deg. will give off $0.03244 \times 454.3 = 14.737$ calories. As many grammes of gold will be required as 3,400 contains 14.737, which is 230.7 grammes of gold.

(8704) T. A. says: The following method is given in "Cyclopedia of Receipts" for deodorizing petroleum: Mix chloride of lime with petroleum in the proportion of three ounces to each gallon of the liquid to be purified. It is then introduced into a cask. Some muriatic acid is then added and the mixture is well agitated, so as to bring the whole of the liquid into intimate contact with the chlorine gas. Finally the petroleum is passed into another vessel containing slaked lime, which absorbs the free chlorine and leaves the oil sufficiently deodorized and purified. Can you suggest the quantities required of muriatic acid and slaked lime? Also if the cask should have one end open or agitated with the bung in? Is there any danger attending this process? A. The quantities of muriatic acid and slaked lime to be used in deodorizing petroleum are not important. If an excess of acid were used, it would disappear when the liquid is passed through the lime. Probably 3 fluid ounces per gallon will be sufficient to furnish enough chlorine for the process. Similarly, the bung may be in or out of the cask. There will not be excessive pressure in the operation; yet if the cask is open, the escape of chlorine will not be very annoying in the open air. The only danger we can see in the work is the inhaling of chlorine gas. This would be disagreeable, and if a large quantity were taken into the lungs, it would be dangerous.

(8705) P. E. J. asks: Does liquid when boiling give off air in the shape of bubbles which pass to the surface? If this is the case, why does mercury do so if this metal is always used to extract air from tubes, etc.? Or is it only the vapor of Hg that bubbles? A. When a liquid is boiling it is giving off its own vapor into the air, if it has been heated for a time sufficient to drive off the contained air. Even mercury contains air under ordinary conditions. Only after it has been heated is the air driven out. In filling a barometer tube the mercury is boiled to get rid of its contained air, which would injure the vacuum.

(8706) W. C. P. asks: Some few years ago I saw on sale a self-lighting gas-tip which I believe was referred to as a platinum sponge. Have you any publications which treat on this subject, its principle and method of construction? A. Self-lighting gas jets are made by placing a lump of spongy platinum so that the gas will strike it. The absorbing power of the sponge is very great. and the absorbed gas becomes so hot that the sponge is heated to a red heat and ignites the gas. Platinum sponge can be obtained from dealers in chemicals. It is simply the Doebereiner's lamp or philosopher's lamp, as it was called, which was used for lighting lamps, etc., before the invention of the friction match. The sponge for some reason soon loses its efficiency.

(8707) J. H. asks: 1. Can you tell me if it is possible to get mica in solution, if so, how? A. Mica is not soluble. It may be ground to a powder and formed into a paste with shellac or some varnish. 2. Is there any form of silica soluble in water, or any other simple solvent? A. There are soluble silicas. Soluble glass, sodium silicate, or potassium silicate, is of this sort. These substances are often called water glass. 3. I once saw some small clay vessels made on the potter's wheel; after a vessel was finished, the exhibitor poured some transparent liquid upon it from a bottle, which glazed and hardened it at once. Can you give a formula for such a liquid? A. You will find a large number of formulas for glazes in the "Scientific American Cyclopædia of Recipes," price $5 by mail. We do not know to what glaze you refer in your inquiry.

(8708) W. J. B. asks: 1. What gas has the most ascending power to the square inch? How much ascending power has it to the square inch? A. Hydrogen is the lightest gas known, and has therefore the greatest lifting power in a balloon; 1,000 cubic feet will lift seventy pounds. 2. Can this gas stand being slightly compressed? A. Hydrogen can be compressed to any extent. 3. Can you give a receipt for partially or wholly petrifying wood and leather? A. If wood be soaked in copperas or sulphate of copper and dried, and the process be repeated till the wood is thoroughly saturated with the chemical, its structure when burned will remain in the peroxide of iron left. Petrified wood in nature is another thing. This is probably formed by the slow action of silica. As a particle of wood decays a particle of silica takes its place, and finally all the vegetable matter is replaced by mineral matter. This process has not been imitated artificially.

(8709) J. D. C. writes: Please send me a receipt for keeping cider sweet. Please tell me also if it will stay sweet in vinegar barrels. A. To preserve cider without fermentation, it is necessary that it be made from good fruit, rejecting all decayed apples, and keeping all apparatus in a clean and sweet condition during the manufacture of the cider. The barrels or casks into which it is put must also be clean and sweet. Vinegar barrels cannot be used, since they already contain the germs of fermentation. Scientific American Supplement No. 313, price ten cents, contains instructions for making and preserving cider. In addition to the preservatives given in that article, you may use salicylic acid, one half ounce to a cask of fifty gallons. It is important to exclude the air as much as possible from the cask all the time, and to avoid stirring up the preservative from the bottom of the cask where it settles.

(8710) M. O. C. asks: Can you inform us how to copper common iron castings without a battery so they will not rust, or how to whiten them by dipping? A. To copper iron castings, the articles must be made perfectly clean, and then dipped in a solution of 1½ pounds copper sulphate in water to which 1 ounce sulphuric acid has been added. They are then washed and dried.

(8711) D. E. asks: Please let me know if there is a cheap and simple way to change 110-volt 1 1-5 ampere alternating current to a steady current? A. A rotary transformer is the only practical way to change an alternating to a direct current. This is a motor run by the alternating current and having a winding leading to a commutator, by which the direct current is taken off at the other end of the shaft of the machine.

(8712) H. B. says: 1. I have a closed-circuit battery in which there are two plates of carbon and one plate of zinc. What would be the solution I could use in this battery to best advantage? A. Use a bichromate solution or a chromic acid solution. 2. In winding the field magnet and the armature core of an electric motor, is it absolutely necessary that the same gage wire be used? That is, must the wire on the field be the same size as the wire on the core? A. No. The gage of wire is determined by calculation and one may be either larger, the same size or smaller than the other.

(8713) W. H. asks: Please give me the best formula for a dry primary battery. A. One of the best dry cells is said to be filled with the following mixture: Oxide of zinc, 1 part by weight; sal-ammoniac, 1 part; plaster of Paris, 3 parts; chloride of zinc, 1 part; water, 2 parts.

(8714) J. H. asks: 1. In a transformer supplied with a two or three-phase current how does the winding differ in said transformer from a single-phase? Is there only one primary circuit? A. A transformer may have any one of several forms of winding for its secondary, on two and three phase currents. In America it is common to use a separate transformer in each phase of a three-phase circuit. Many diagrams of connections and wiring may be found in Sheldon's "Alter-

(Continued on page 248)

HOW A HYPNOTIST MADE A FORTUNE.

The Secret Methods by Which Dr. X. La Motte Sage, the Greatest Hypnotic Scientist of the Age, Created a Tremendous Sensation.

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Dr. X. La Motte Sage made a fortune out of Hypnotism. He probably knows more about the subject than any living man. His methods are radically different from any ever before presented. By his new system he hypnotizes people instantaneously. He tells you how to exert tremendous silent influence without making a gesture or saying a single word. He gives the only real, practical methods for the development of the power of Personal Magnetism that have ever been published. During all the time that Dr. Sage was before the public he made it his business to note carefully the effect of hypnotism upon the human mind. He became convinced that this mighty, mysterious power could be utilized to the advantage of ambitious men and women who wished to better their condition in life. To demonstrate the correctness of his ideas, when he retired from public life he founded a college where Hypnotism, Personal Magnetism, Magnetic Healing, etc., might be taught along the definite lines he had laid down. The result is that the college has grown to be the largest of its kind in the world. Thousands of successful students in all parts of the globe are living witnesses to the wonderful power and the great practical benefits to be derived from Dr. Sage's methods. The Doctor has recently written a book entitled "The Philosophy of Personal Influence," in which he tells in plain, simple language just how to acquire hypnotic power and the various uses to which it may be put. Among the many interesting things upon which the book treats are: How to develop magnetic power and influence people without their knowledge; how to implant a command in a subject's mind that he will carry out in every detail a month or a year hence, whether the hypnotist is present or not; how to hypnotize people at a distance; its value in business; marvelous scientific tests how to prevent people from influencing you; hypnotic power more fascinating than beauty; the use of hypnotism in the development of the mental faculties; controlling children, etc.

The college which Dr. Sage has founded proposes to give away $10.000 worth of the above books absolutely free so long as the special edition lasts. Any person who is in earnest can get a copy merely by writing for it. This book is handsomely illustrated by the finest half-tone engravings. It tells you how the marvelous power of hypnotism has been used to cast a secret mystic spell over people without their knowledge and how they have been for months, and in some cases even years, obeying the royal will of another. It gives you the secret of the development of what Senator Chauncey M. Depew calls the money-making microbe. Don't think because you lack a fine education and are working for a small salary that you cannot better your condition; do not think because you are now successful in life that you cannot be more successful. Dr. Sage's book has been read and his methods are to-day being used by many of the richest men in the world. They know the value of personal influence, of hypnotic power. If you are interested write to-day to the New York Institute of Science, Dept. PT3, Rochester, New York, and a copy of Dr. Sage's book will be sent you by return mail absolutely free. This is a rare opportunity to learn the uses and possibilities of the most wonderful, marvelous and mysterious power known to man. The book is enthusiastically indorsed by the most prominent business men, ministers of the gospel, lawyers and doctors. It should be in every home; it should be read by every man and woman in this country who wants to better his condition in life, who wants to achieve greater financial success, win friends, gratify his ambitions and get out of life the pleasure and happiness which the Creator intended he should enjoy.

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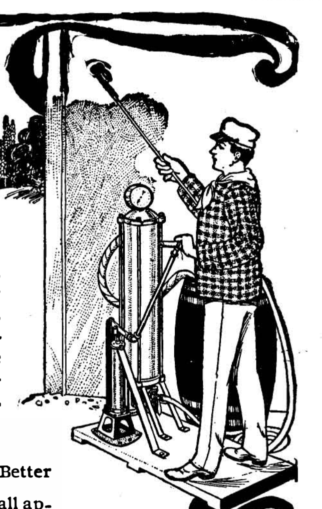

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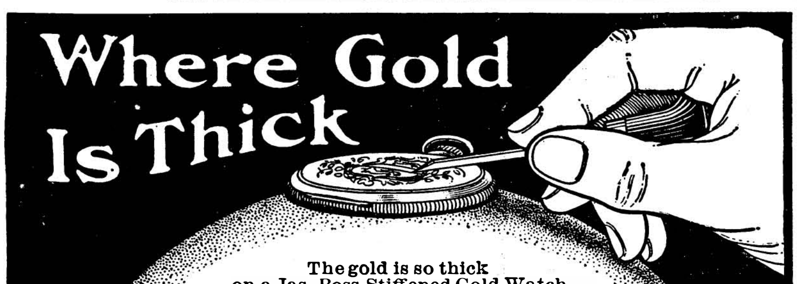

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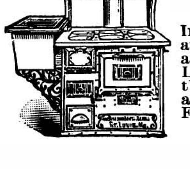

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nating Current Machines," price $2.50 by mail. 2. What is the general belief as to the velocity of the electric current? Is it possible that it travels 288,000 miles in one second? Would it not consume the conductor by heat? A. Probably. No one now believes that electricity travels 288,000 miles a second. The velocity of electric waves through space is believed to be the same as that of light, 185,000 miles per second. The electric current travels along a wire much slower than that. Prof. Barker in his "Text-Book of Physics" says: "It is evident that the term velocity of electrical transmission has no definite meaning."

(8715) A. S. asks: Can a waterwheel drive anything, or give power, if its speed is increased by any motor over the speed which the water imparts to it? In other words, if it is driven faster than it would run being released from all load. A. A waterwheel given an increased speed by means of a motor will give less power from the action of the water in proportion to the increased speed; but the power of the motor must be added for the total work. If the power of a motor is added to the wheel at its normal speed, the whole value of the motor will be added to the full power of the wheel alone.

(8716) G. B. K. asks: 1. Kindly inform me through your columns the dimensions of the envelope of a balloon, cigar-shaped, which would raise one pound seventy-five feet in the air, inflated with illuminating gas? A. About twenty-five cubic feet of illuminating gas are required to lift one pound. The weight of the balloon is included in the weight lifted, of course. 2. What kind of paper can be used for making small balloons and where can it be had? A. Any sort of paper may be used for making a balloon. The paper would need to be varnished to enable it to retain the gas, which would otherwise pass easily through the pores of the paper and escape.

(8717) C. M. D. asks: 1. What is the normal humidity for this locality? A. The mean annual relative humidity of Philadelphia is about 70 per cent. This is what we understand the phrase "*normal humidity*" which you use means. We do not know any normal or proper humidity. At least the proper humidity must be the average humidity. 2. What per cent of saturation should the atmosphere contain to be normal for respiration? A. The relative humidity for respiration may be anything from 30 to 75 and perhaps more according to the temperature. There is a wide range possible in which respiration is healthy and no harm can come to a person from using the air. 3. What volume of water should the atmosphere of a room 16 feet x 10 feet x 10 feet contain with the humidity normal and the temperature at 75 deg. F? A. At 75 degrees the relative humidity is about 75 per cent. This is the mean for July in the eastern United States, and may be taken for the mean at that temperature in a room. Under these conditions the air contains 6 grains of water per cubic foot. 4. Would the air in the living rooms of a house contain more moisture (volume) at the point of saturation than the normal atmosphere outside? A. The air in a room, if at a higher temperature than the outside air and saturated, will contain more weight of water than the air outside. This, however, cannot be realized except by artificial means, since the air which enters the room and is heated will by heating have its degree of saturation reduced. Its relative humidity will become lower, while the number of grains per cubic foot will be the same as before it entered the room.

(8718) X. asks: Does Mr. Edison send up an electric star so people from miles away can see it? A. There can be no such thing as an electric star. Any one who knows the amount of the curvature of the earth in an approximately level country will know that an electric light cannot possibly be hoisted high enough on a pole to be visible from afar. What, then, is seen to give rise to the idea? It is doubtless the evening star near its setting, or some bright star which happens to be in a position to be seen in the direction of Mr. Edison's home from the point of view of the observer. We think that is all there is in the question. That Mr. Edison sends up an electric light for this purpose has been denied over and over again.

(8719) S. V. T. asks: In what leap year did February begin with Sunday, the first of the said month, and end with Sunday, the 29th of said month? What year will the same dates happen again? A. A common year of 365 days has 52 weeks and 1 day; hence it begins and ends on the same day of the week, and each year begins one day of the week later than the year before it. A leap year has 52 weeks and 2 days; hence it ends one day in the week later than it began, and the year following a leap year begins two days in the week later than the preceding leap year. Also, in order that February of a year may begin on a Sunday, it is necessary that January should begin on Thursday. Bearing these facts in mind, it is very easy to count forward and backward and find a leap year beginning on Thursday. The last leap year to begin on Thursday was 1880; the next will be 1920. There are rules better than the above for calculating dates, past and future, but for finding a day in a year near at hand this seems to be the simplest method.

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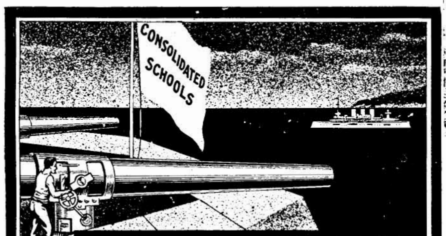

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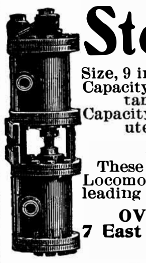

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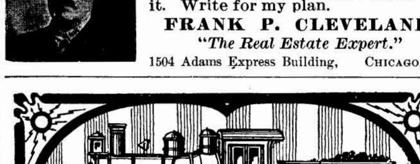

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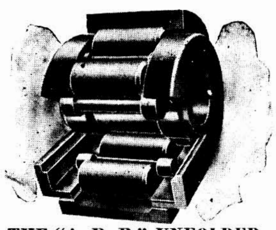
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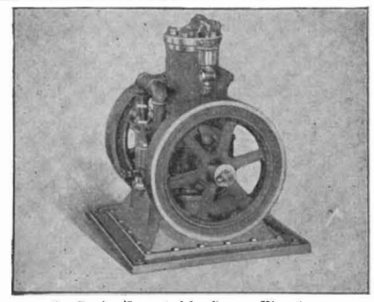
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